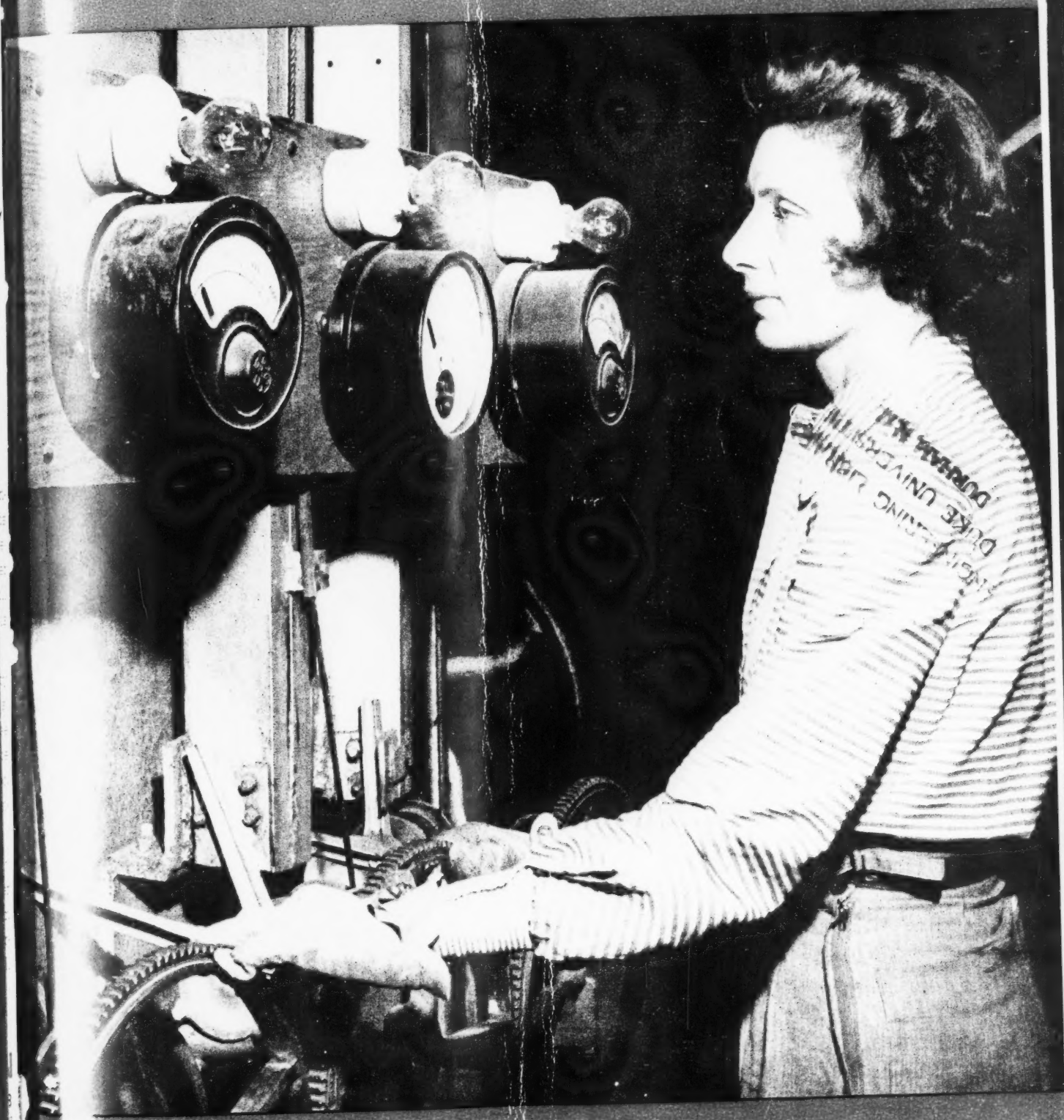
ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS



Gray-Hill Co.
California

OCTOBER, 1943

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Looking toward the day when there will be plenty of new electrical products available for every home, the Edison Company is now preparing its postwar plans.

Broadly speaking, it is Edison's aim to lay a firm foundation for all-electric living throughout Southern California by informing consumers and reminding electrical contractors of the vital importance of adequate wiring in every home.

The Edison Company feels that the entire electrical industry will benefit from such a program.

SOUTHERN CALIFORNIA Edison

"WASTE IN WAR IS A CRIME . . . DO NOT WASTE ELECTRICITY JUST BECAUSE IT IS NOT RATIONED"

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), October, 1943. Vol. 91, No. 4. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, 4, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shillings). Single copy 25c.
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OCT 22 1943
Durham, N. C.

An Engineering Executive from New England writes:

"It seems to me that an attempt to standardize heavy apparatus is timely and can be carried out without interfering with progress in design."

AMONG the responses to General Electric's proposal advocating further standardization of power apparatus, this comment from New England strikes a particularly pertinent note. It recognizes the fact that standardization need not mean the freezing of design.

Indeed, development of designs for repetitive manufacture often involves more real pioneering than a succession of "tailoring" jobs. G-E metal-clad switchgear is a case in point, where improvement continues year after year. Our wartime mass production of turbines for ship propulsion has also moved hand in hand with increasingly efficient design.

In this same letter, the writer goes on to say: "Savings in both manufacture and adaptation will certainly result from this program. We will be pleased to co-operate with you."

It is such willingness to co-operate, we believe, that will make this plan bring about lower equipment costs. Builders and users must work together. They must be willing to accept minor limitations on individual preferences for the sake of major gains over all. That is why we are anxious to have you explore the proposal with your associates, bringing to our attention any unanswered questions that may arise. *General Electric, Schenectady, N. Y.*

GENERAL ELECTRIC

201-104

Here in the WEST

People

R. W. Steenrod

is the industrial heating specialist for General Electric in California, but he hails from Ohio, was graduated as an electrical engineer from Ohio State, followed by the test course at Schenectady. He first devoted his energies, of which he has abundant supplies, to air conditioning and commercial refrigeration. He did some industrial heating engineering in Chicago and in Schenectady and was sent to Los Angeles in 1942. Now both heat and air conditioning knowledge are combined in specifying controlled atmosphere heat treating for Western war plants. Some of the types of furnaces in this region are touched on in his article on p. 54. Of more than 20 types, with variations, this brief round-up is sufficient to indicate the kinds of work they will do.

K. R. Collins

though from Missouri, was shown the principles of electrical engineering at Cal-Tech. He also spent his school years in Pasadena. He had a year as engineering student at Westinghouse in East Pittsburgh, then was sent to San Francisco in the engineering and service division. In 1942 he was sent to Los Angeles in similar capacity. On the side he does war training teaching in electronics, motor functions and maintenance.

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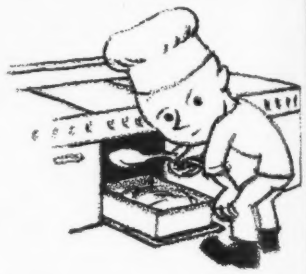
Cover photo: Mrs. Edouard Thys operating the homemade electric furnace, described on page 52.

Preview

Commercial Cooking

is what it used to be called, but since the only customer these days is Uncle Sam, perhaps the "commercial" must wait for better days after the war. Certainly Uncle Sam is using heavy duty electrical equipment plentifully in hospitals, camps, on board ships, in planes and in submarines. Next month descriptions of some of these installations will be followed up by: 1. observations as to the potentialities for this kind of load and business after the war; 2. some of the factors in selling it successfully.

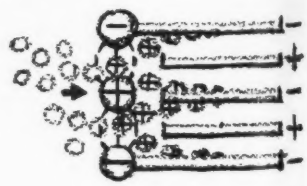
Out of Salvage



Just as an electric steel furnace was assembled out of scrap from three states, as described in this issue, p. 52, next month there will be an account of an equally dramatic job, that of assembling a hydro-plant out of scrap and odds and ends. It is the Cline plant of Pacific Power & Light Co. on the Deschutes River. Again the ingenuity of American enterprise achieved the impossible.

Power Pool

Many of the operating problems, and solutions for them, in governing, telemetering and load control of the Pacific southwest power interchange will be discussed by engineers concerned, in next month's issue.



Precipitron

Far from being a mere plaything of science, the electrostatic air cleaner is finding some new and important uses here in the West in war industries. A few of these, to indicate its possibilities, will be disclosed, too, in the November number. These are but samples of the many fine features in view.

L-M PVD

...the only fuse cutout of its kind, gives better protection because of these factors

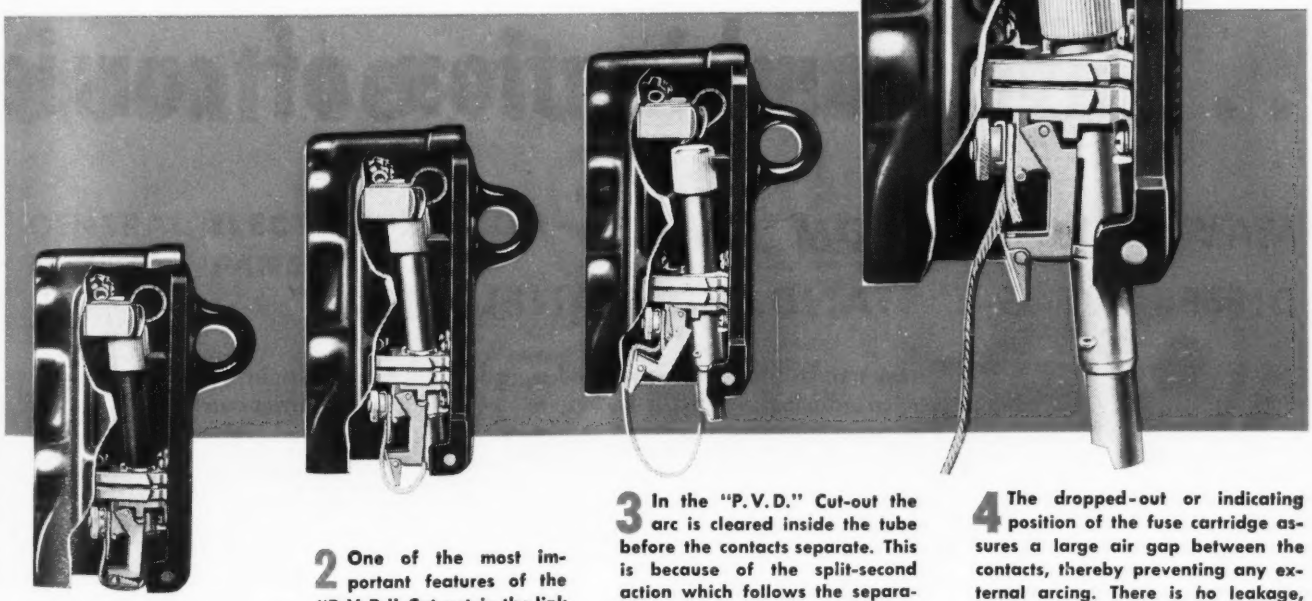
★ **unfailing operation** Because operation of the PVD is independent of any door movement and because all working parts are fully protected, the PVD operates as a disconnecting or dropout cutout *at all times*. Cartridges will always be out of circuit when link has blown.

★ **spots trouble** Tell-tale position of the dropped down cartridge is readily visible from any direction and from distance—spots the trouble quickly and saves hunting.

★ **safe, cool contacts** Positive, heavy contacts, large contact surfaces, elimination of intermediate current carrying parts in circuit path, keep operating temperatures of PVD low.

★ **arc quickly cleared** When link blows, flip-out device pulls the link apart and out of the cartridge. Arc is positively extinguished before any contacts move or separate. A large airgap between contacts prevents any re-establishing of the arc.

★ **easily, quickly re-fused** Outages quickly restored. The PVD can be re-fused in one minute—a safe, easy operation right on the pole, even with gloved hands.



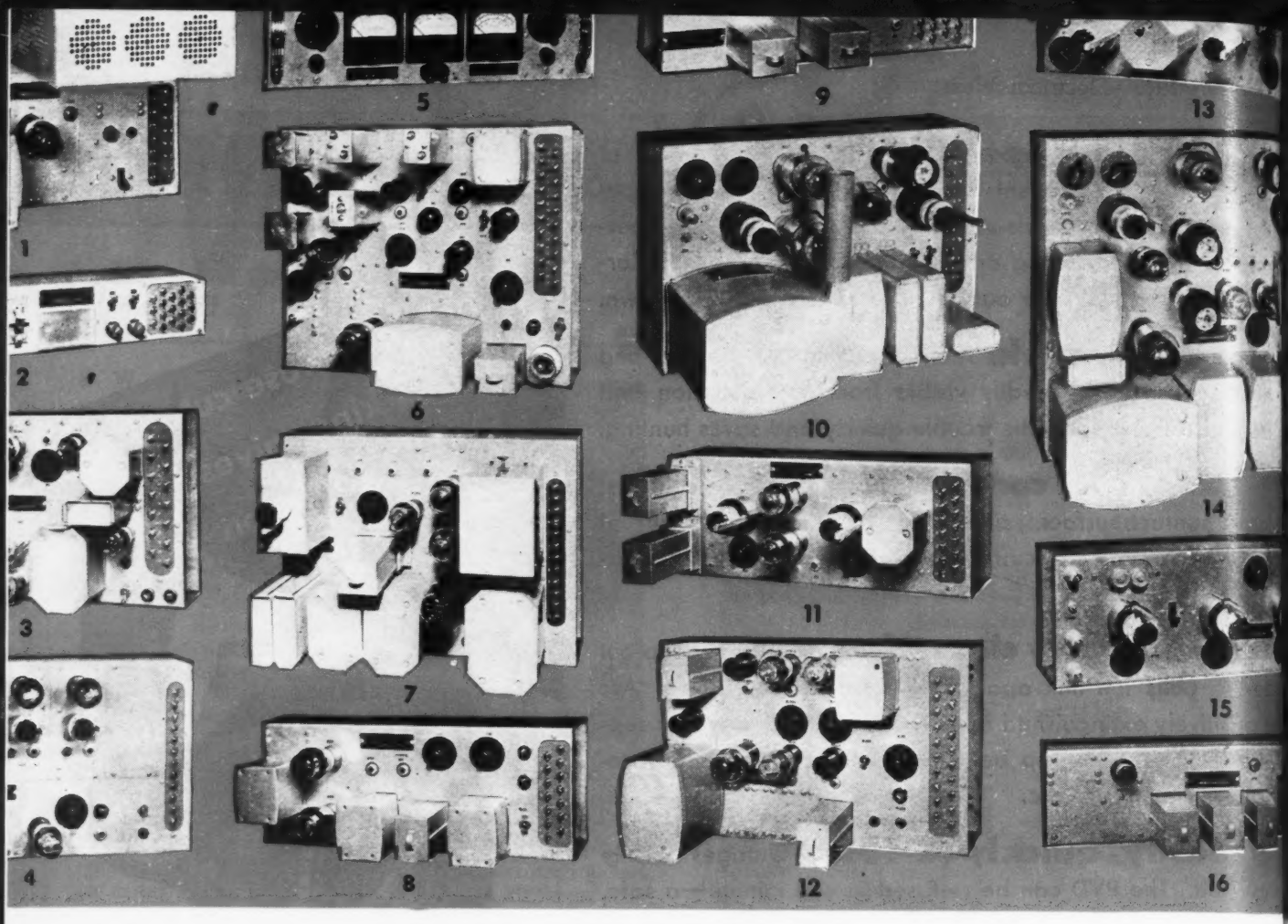
1 The "P. V. D." Cut-out is always protected. The rugged Bakelite door remains closed even after the fuse link has blown. Its contacts assure safe, cool operation because they are always sealed from weather, dirt, and corrosion.

2 One of the most important features of the "P. V. D." Cut-out is the link flip-out device which assures instant separation of the blown fuse link parts before the latching lever releases the tube to the indicating position. There is a positive time delay. The flip-out device snaps down, the blown link is separated instantly.

3 In the "P. V. D." Cut-out the arc is cleared inside the tube before the contacts separate. This is because of the split-second action which follows the separation of the blown link. The latching lever releases the tube, permitting it to drop to the indicating position. The upper contact follows this tube when dropping and, therefore, maintains contact during a good portion of the downward travel of the tube. This absolutely assures the arc being cleared before the contacts separate.

4 The dropped-out or indicating position of the fuse cartridge assures a large air gap between the contacts, thereby preventing any external arcing. There is no leakage, no radio interference. Because metal slides on metal when the cartridge drops, it operates smoothly without sticking, which assures dependable, positive operation under all weather conditions. In addition to this, the dropped-out position is a signal easily seen from the ground and prevents hunting for the cut-out with the blown fuse link.

LINE MATERIAL COMPANY LM



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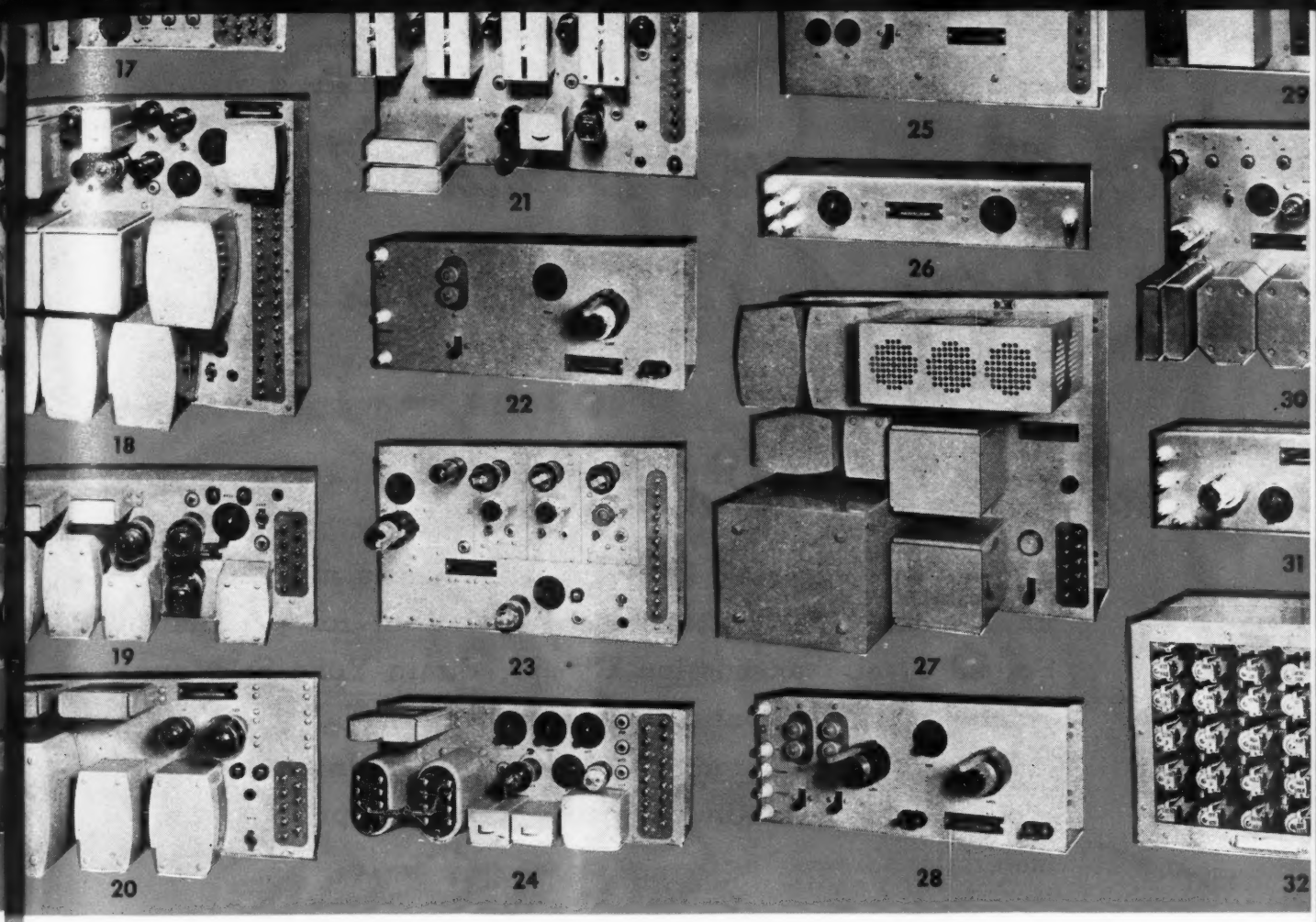

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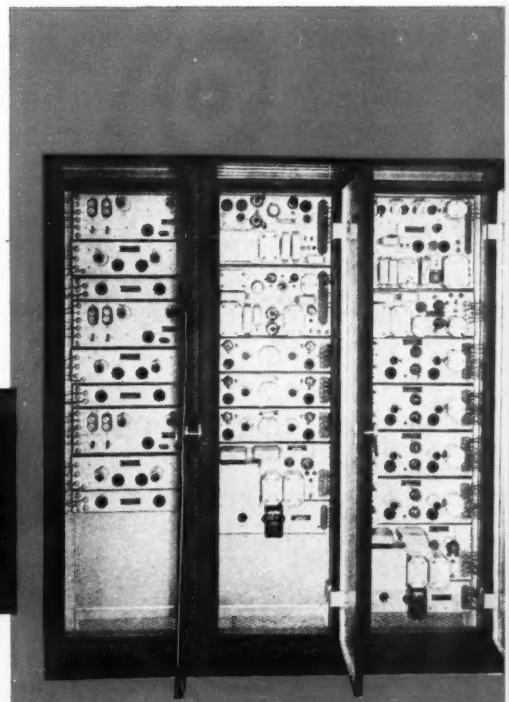
3. Telephone modulator.
4. Telemetering transmitter.
5. Meter unit.
6. Superheterodyne receiver.
7. Supervisory control transmitter.
8. Relaying modulator.
9. Simplex telephone auxiliary.
10. Transmitter, 50-150 kc.
11. Audio filter and relay.
12. Single-frequency duplex telephone control.
13. Audio oscillator.
14. Transmitter-modulator, 50-150 kc.
15. Two-frequency line tuning.
16. Simplex telephone auxiliary, 800-cycle, ringing.
17. Single-frequency duplex telephone code ring.
18. Power supply for selective ringing.
19. Audio amplifier.
20. Power supply for audio units.
21. Telemetering or control receiver.
22. Single-frequency ground-return line-tuning unit.
23. Load-control or supervisory transmitter.
24. Two-frequency duplex telephone control.
25. Input-voltage control.
26. Impedance matching transformer.
27. Power pack for carrier-frequency amplifier.
28. Interphase line-tuning unit.
29. Telephone-line protective-and-jack unit.
30. Telemetering or control transmitter.
31. Double trapping unit.
32. Selective ringing unit.



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THE NERVE NETWORK OF THE POWER SYSTEM

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W.P.B. has ruled that

The Brewer-Titchener Corporation, as prime manufacturer, having existing dies, tools, and equipment for producing Forged Steel Transmission Clamps, Strain Yoke Sets, and Hardware, but without equipment or facilities for the manufacture of similar products in other materials or by other processes, may continue to offer, sell, and produce such materials.

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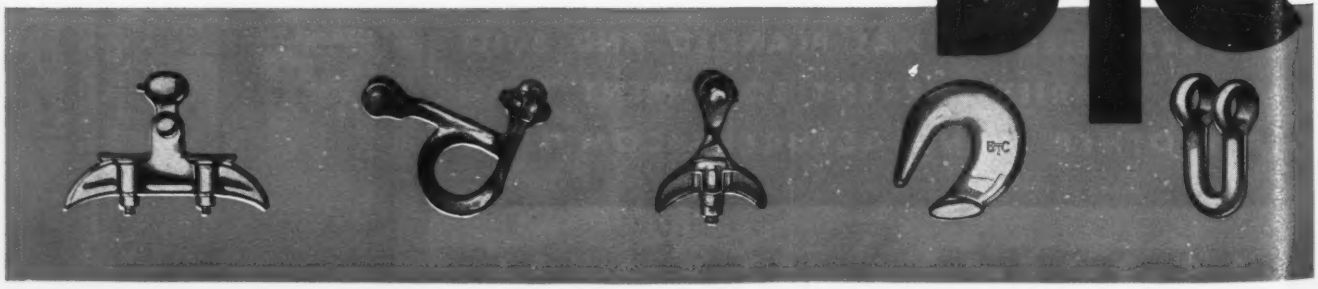

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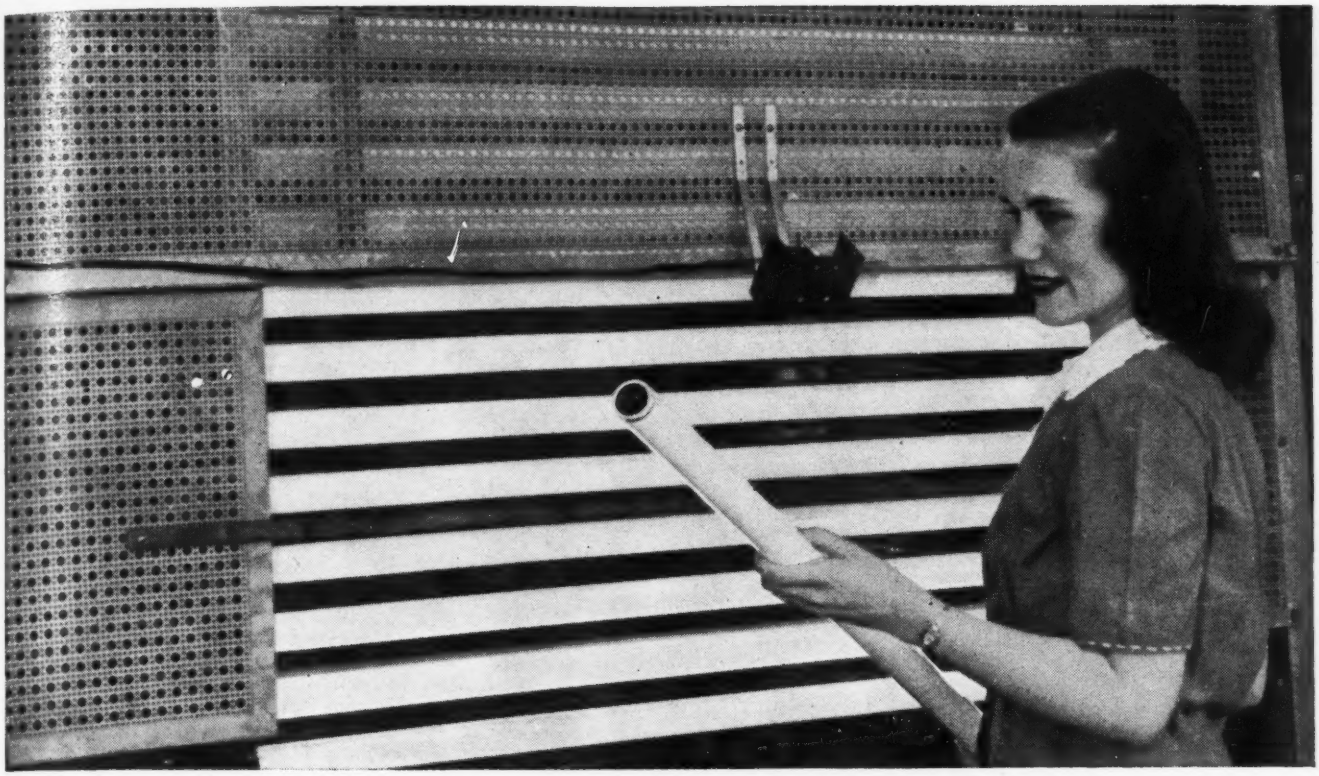

AGE BEFORE DUTY..

• When properly "aged" or seasoned, fluorescent lamps remain more constant than daylight throughout their entire life. This is important in lamps that illuminate precision work in war plants.

At Sylvania there is a special "age before duty" machine that lights and relights fluorescent lamps for carefully regulated time intervals. This mellowing process prepares all the elements that make up a lamp for a life of uniform light output. It is also a final precaution taken to weed out an occasional substandard lamp which may have filtered through dozens of painstaking inspections.

That is why a Sylvania Fluorescent Lamp can be counted on for consistent light output every minute of its life.

"Aging" is one of many Sylvania methods of safeguarding fluorescent quality. Lamp efficiency is perfected and maintained at its highest peak through continual research by Sylvania engineers who have years of specialized experience with incandescent lamps, radio tubes, ultra-violet lamps and other electronic devices.

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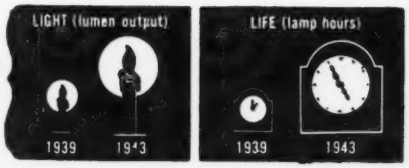

(Based on decreasing price and increasing efficiency and durability of Sylvania 40-Watt White Fluorescent Lamp)

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BOOKS *you may want*

BASIC ELECTRICITY FOR COMMUNICATIONS, by W. H. Timbie, 576 pages, Appendix 14 pages, 5¾ x 8, 464 figures and illustrations, John Wiley & Sons, $3.50. The first chapters discuss the electronic theory and the fundamentals of the generation and transmission of electrical power and energy, that is: Ohm's law, electrical conductors and insulators, resistance, inductance, capacitance, magnetic circuits, the effect of magnetic fields. A knowledge of Kirchoff's laws is most important and is given careful treatment.

Electrical equipment, such as generators, motors, batteries, electromagnets are clearly described and many illustrations are included. The theory underlying the design of such equipment is concisely presented. Many applications are shown.

Alternating current theory is treated in a clear and understanding manner, so that the beginner will have no difficulty with its principles and laws.

A particularly important chapter is the simplification of circuits making use of Thevenin's theorem. This theorem gives the student a powerful analytical tool which is a great aid to assist him to solve complicated electrical circuit networks which electronic devices require.

The last chapters describe the application of electrical theory to communication and radio devices. Vacuum tubes are given an elementary treatment and their application to radio transmitters, receivers and industrial electronic devices is described.

The appendix contains tables and other information useful to both the student and the engineer. This book is written for the individual who needs a thorough background of the electrical fundamentals required to solve many communication and electronic problems. Problems of a practical type are given to acquaint the student with the methods required for solution.—F.S.B.

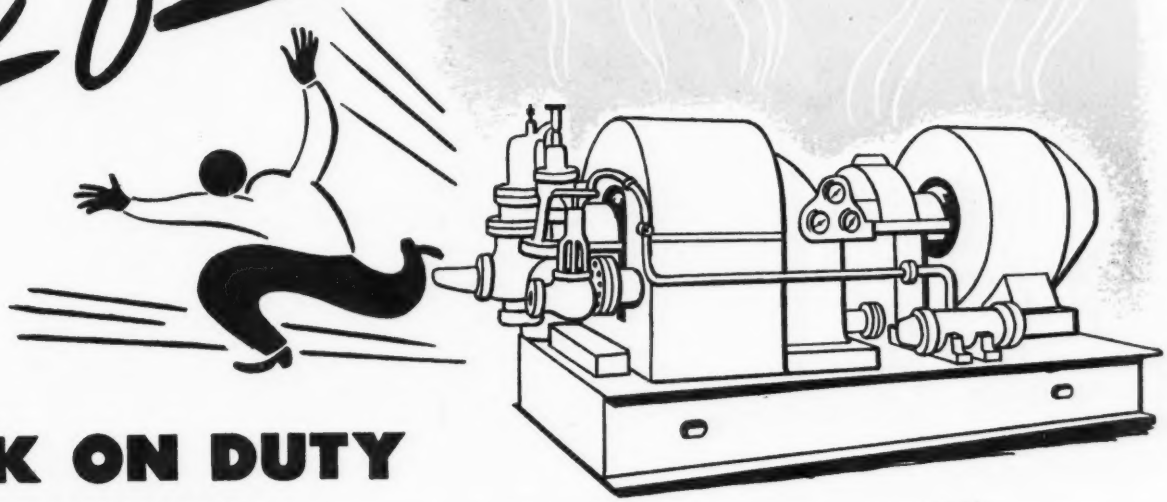
ELEMENTS OF ELECTRICAL CIRCUITS AND MACHINERY, by Grover C. Blalock, 347 pages, with diagrams and illustrations, 8 x 5½, McGraw-Hill Book Co., $3. This book is largely an abridgment of the author's *Principles of Electrical Engineering* now in the ninth impression of the second edition and widely used as a classroom text book, but too comprehensive for the briefer courses in electrical circuit theory and practical application of electrical equipment now very much in demand in connection with the war effort.

The author has done an excellent job of preparing a text which will make it possible to present a practical course in electrical fundamentals to those of limited educational background. All references to calculus and differential equations have been omitted and mathematical treatments have been sharply curtailed. References to the simple trigonometric functions necessary in connection with alternating currents can be comprehended after a brief explanation by the instructor.

Each chapter concludes with a list of practice problems, not too difficult but re-

(Continued on Page 14)

on fire Friday



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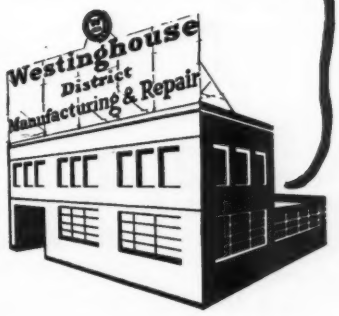

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General Electric Company, Section C452-20
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GENERAL ELECTRIC

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quiring some thought, and a list of review questions, the answering of which will assist the student in assimilating the more important principles developed within the text of the chapter. The book concludes with a group of 24 laboratory experiments directed primarily upon the operation and operating characteristics of direct-current motors and alternating-current machinery. An appendix contains a number of tables arranged for convenient reference, also complete instructions for the prone pressure method of resuscitation from electric shock.

The book should find ready acceptance by teachers and instructors offering the briefer courses in electrical circuit theory and should be in the hands of all of those who are engaged in the application of electrical equipment but who have not had an opportunity to study electrical fundamentals in the course of their schooling.—E. A. C.

LETTERS
to the editor

To the Editor:

In the September issue of ELECTRICAL WEST there were two items referring to plans made at Eugene, Ore., for a stockpile of jobs to meet a postwar depression. It was claimed that the municipal power utility is planning to start an extensive underground system. I believe that this impression should be corrected.

Some civic leaders have contacted the Eugene School Board, the City Council, and the Eugene Water Board—the latter being the independent authority which manages the municipal water and electric utilities—in connection with plans to meet a postwar depression. In the course of the conversation with the Water Board representatives it was mentioned as a possibility that the whole urban electric system—some 80 miles—might be placed underground. They were told that the cost of such a job would be out of reason.

Conditions here are such that it will be considerable time before any general underground system is justified. When it is started the first section will involve something like one mile—not 80 miles. We believe a program of construction soon after the war is justified, and plan to improve an obsolete hydro plant at the time; and to resume improvements and extension of our overhead distribution and transmission systems which were interrupted by the war. There are no rate increases contemplated.

H. P. CURRIN, Superintendent,
Electrical Department,
Eugene Water Board.
Eugene, Ore.

To the Editor:

I received my first issue of ELECTRICAL WEST and am well pleased with it. I enjoyed the article about the wire mill in Pittsburg, Calif., and the way the writer explained it. Enclosed you will find the circular marked for information that would be of value to me up here. I am foreman of power house construction.

C. A. DE TIENNE,
Guy F. Atkinson Co.
Excursion Inlet, Alaska.

VICTOR INSULATORS INC
VICTOR, NEW YORK
Distributed by MAYDWELL & HARTZELL, Incorporated
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Wire and Cable Division
ALL TYPES RUBBER AND SYNTHETIC COVERED WIRES AND CABLES
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MORE KILOWATTHOURS FOR VICTORY

PUT INACTIVE METERS TO WORK

...for wartime service

To provide help to this end, Westinghouse offers a practical Meter Conversion guide—"Wartime Utilization of Existing Watthour Meters."

This book tells how Westinghouse meters not now adapted to present needs may be converted and restored to service. The procedures are simple, and require a minimum of labor and strategic materials.

Your Westinghouse representative will be glad to give you further detailed information on special cases. Phone your local representative, or write Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa. J-97076

"Wartime Utilization of Existing Watthour Meters" contains suggestions and instructions for changing single-phase meter ratings to suit present-day requirements. Ask for B-3233.

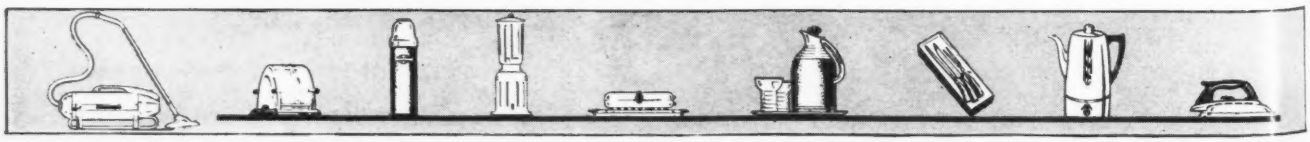
Westinghouse

PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

A PRACTICAL DOWN-TO-EARTH APPROACH TO YOUR POST-WAR PROBLEMS

Comprehensive Enough to Be of Real Help Now—Flexible Enough to Fit the Needs of Every Dealer

• To help you make a bigger profit from the tremendous postwar market, Universal contributes the "U" Plan for "V" Day. It crystalizes customer thinking now about intended appliance purchases after the war. It puts the sales of tomorrow on your books today for ready market analysis and easy follow-up. It stimulates quick turnover for maximum profits. It provides for the distribution of merchandise in an efficient, orderly manner whether your customers are interested in a single appliance or a completely equipped kitchen. And finally it establishes your store as appliance and housewares headquarters today well in advance of the competitive selling period.



by UNIVERSAL

HOW THE "U" PLAN FOR "V" DAY WORKS

Through 40 million full page color messages in 14 national magazines, Universal is telling consumers throughout 1944 about its "U" Plan for "V" Day—urging them to plan now in order to secure the housewares they will need after Victory.

Each advertisement includes a handy check list upon which readers can indicate the household devices they will need and estimate their approximate total value on a basis of 1941 prices.

The "U" Plan urges consumers to buy War Bonds now equivalent to the amount needed later for the desired appliances and housewares.

To participate fully in the "U" Plan, consumers are instructed to take their check lists to the nearest Universal dealer and to ask him for priority consideration as soon as the products are available.

The dealer then fills out a duplicate copy of the consumer's list for his prospect file and priority rating.

When merchandise is available, the dealer can easily notify his customers by telephone.

Consumer inquiries mailed direct to the factory will be referred to the most conveniently located "U" Plan dealer.

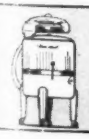
HOW THE "U" PLAN FOR "V" DAY HELPS YOU

1. It provides a flexible, fair and orderly plan for handling a large volume of business during the competitive post-war period.
2. It creates a backlog of potential orders identified as to customers names and addresses.
3. It indicates the type and price range of items likely to be demanded by your customers thus guiding your purchases more accurately.
4. It lowers selling costs by directing customers into your store without the expense of field calls and other promotion.
5. It establishes your store now as appliance and housewares headquarters for post-war sales.
6. It develops store traffic for the immediate sale of available merchandise.
7. It brings you into contact with prospects for immediate appliance servicing.
8. It helps you renew friendly relations with old customers and introduces you to that big 3 million market of newly-weds.
9. It identifies you with a nation-wide offer to step up the sale of War Bonds.
10. It pre-sells 135 million Americans on the quality and wide range of Universal household equipment and favorably establishes the identity of the Universal trademark.

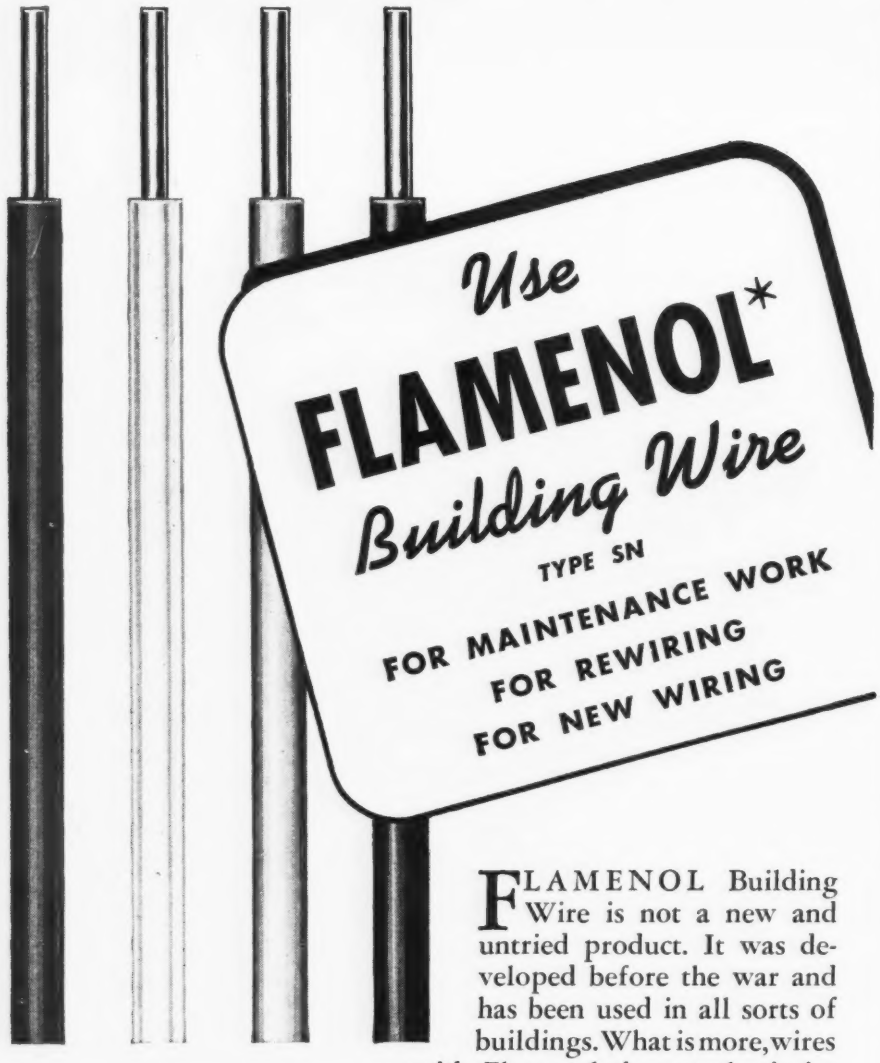
• The "U" Plan for "V" Day is complete in every respect. Full page color advertisements featuring the "U" Plan for "V" Day will appear in a list of 14 magazines for 1944. To establish your store as "U" Plan headquarters, point-of-sale materials including blow-ups of national advertising, identification decals, consumer folders, War Bond envelopes and priority certificates will be available. *Wire, write or phone your Universal distributor or Dept. EW, Landers, Frary & Clark, New Britain, Conn.*

LANDERS, FRARY & CLARK • NEW BRITAIN, CONN.

© 1943 LANDERS, FRARY & CLARK



UNIVERSAL



FLAMENOL Building Wire is not a new and untried product. It was developed before the war and has been used in all sorts of buildings. What is more, wires with Flamenol thermo-plastic insulation have been used for a much longer time — switchboard wire, wire for signal circuits, machine tools, etc. It is approved by the Underwriters'.

Flamenol Building Wire is available now in sizes 14 to 1,000,000 CM. (Resins are permitted for electrical conductor insulation wherever copper is allocated.) Use this wire for the war-purpose jobs you are handling. It is easy to use and will give long service.

For further information see the nearest G-E Merchandise Distributor or write to Section W-1031-18, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

*Reg. U.S. Pat. Off.

Look at the Features

1. Small in diameter — Saves space.
2. Superaging—Long life, no oxidation
3. Easy pulling — Hard, smooth finish
4. Heat resistant — Rated 60 deg. C.
5. Free stripping — Speeds splicing and soldering
6. High dielectric strength—720 volts per mil, test result
7. Flame proof — Will not support combustion
8. Insulation — Tensile strength of 2000 lb. per sq. in., test result
9. Many colors—Same range as Type R wires
10. Oilproof — Unaffected by oils, water, acids, alkalies
11. Attractive — Retain fine appearance
12. Self-protecting—No braid necessary

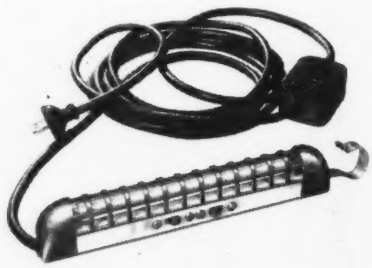
GENERAL ELECTRIC

PRODUCTS
that are news

F Extension Cord (1000)

Sylvania Electric Products has streamlined its P-7 fluorescent extension cord unit for greater efficiency. The new design includes faster lamp change, rounded ends, rigid hanging hook riveted to the end cap, improved finish.

This unit utilizes the 6-watt fluorescent



lamp; total wattage including lamps and auxiliary 8 watts. Over-all length is 10¼ in.; height 1⅞ in.; width 1-3/16 in.; average weight 2½ lb. including ballast. Operates on 110 to 125 volts, 60 cycle a-c. Sold complete with 12 ft. of two-wire cord.

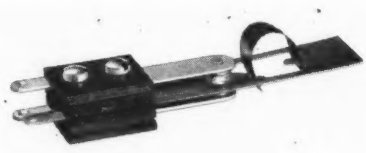
Air-Cooled Ballast (1001)

Designed for exposed mounting on fluorescent lamp fixtures, to save metal housing, a new air-cooled type ballast has been announced by Acme Electric & Mfg. Co. It is claimed that this ballast differs from the conventional Acme design only in that the leads are brought out through outlets in the base plate. The manufacturer states that because of the exposed installation, these ballasts will operate at lower ambient temperatures than enclosed type ballasts. Built in approved ratings for single, two, three and four lamp fixtures.

Switch (1002)

Acro Electric Co. has developed a small open-blade snap-action switch designed for a variety of applications, including machine tool control devices, aircraft landing gear controls and construction of relays and contactors.

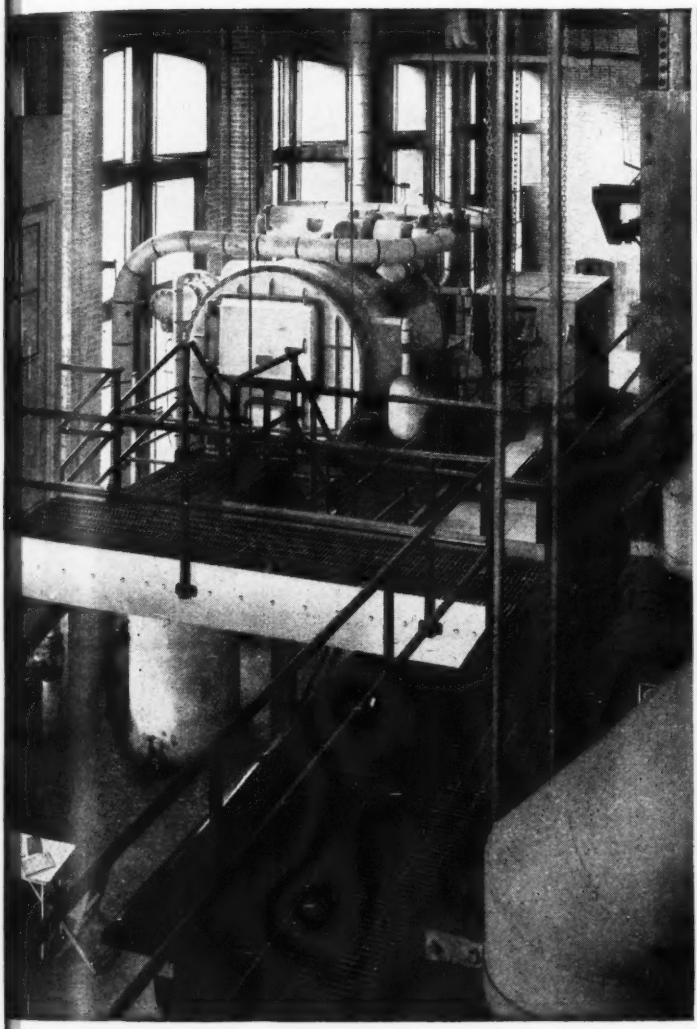
According to the manufacturer, a patented rolling spring produces a positive

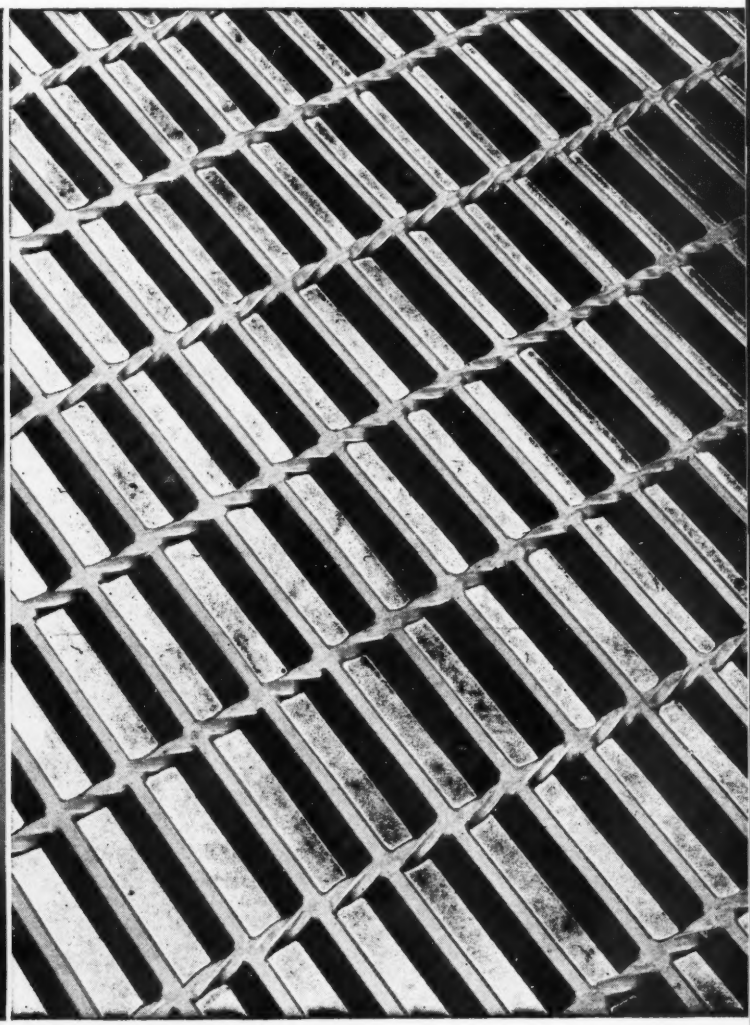


snap action with less than six ounces of operating pressure. Because of fast action, operation of the rolling spring is said to minimize contact burning.

The switch is designed to permit both pre-travel and over-travel. It has a rating of 15 amp. on 125 volts a-c. Over-all size is 3-1/6 in. by 11/16 in. by ½ in. Made in single-pole, single- or double-throw, set and return types. Also assembled to suit needs of relay builders.

ON THE GROUND...OR HIGH ON A CAT-WALK
THE TWISTED BAR MEANS SAFETY





SAFE, because the twisted bar prevents slipping . . . and STRONG, because it's electroforged into one solid piece. Whatever your grating needs, you can depend on Blaw-Knox!

BETTER . . . 5 WAYS

1. Self-cleaning, no sharp corners to clog.
2. Maximum open area for light and air.
3. Easy to maintain . . . paint reaches entire surface.
4. Strong electroforged construction means easy erection.
5. Safe footing at all times . . . with twisted cross bar.

A Catalogue and paper weight size sample will be sent upon request made on a firm letterhead.

BLAW-KNOX STEEL GRATING

BLAW-KNOX DIVISION OF BLAW-KNOX CO.
2098 FARMERS BANK BLDG. · PITTSBURGH, PA.

NEW YORK · CHICAGO · PHILADELPHIA · BIRMINGHAM · WASHINGTON

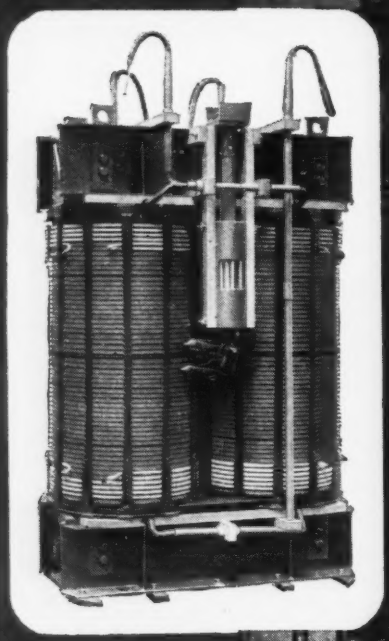
SAN FRANCISCO
W. S. Wetenhall

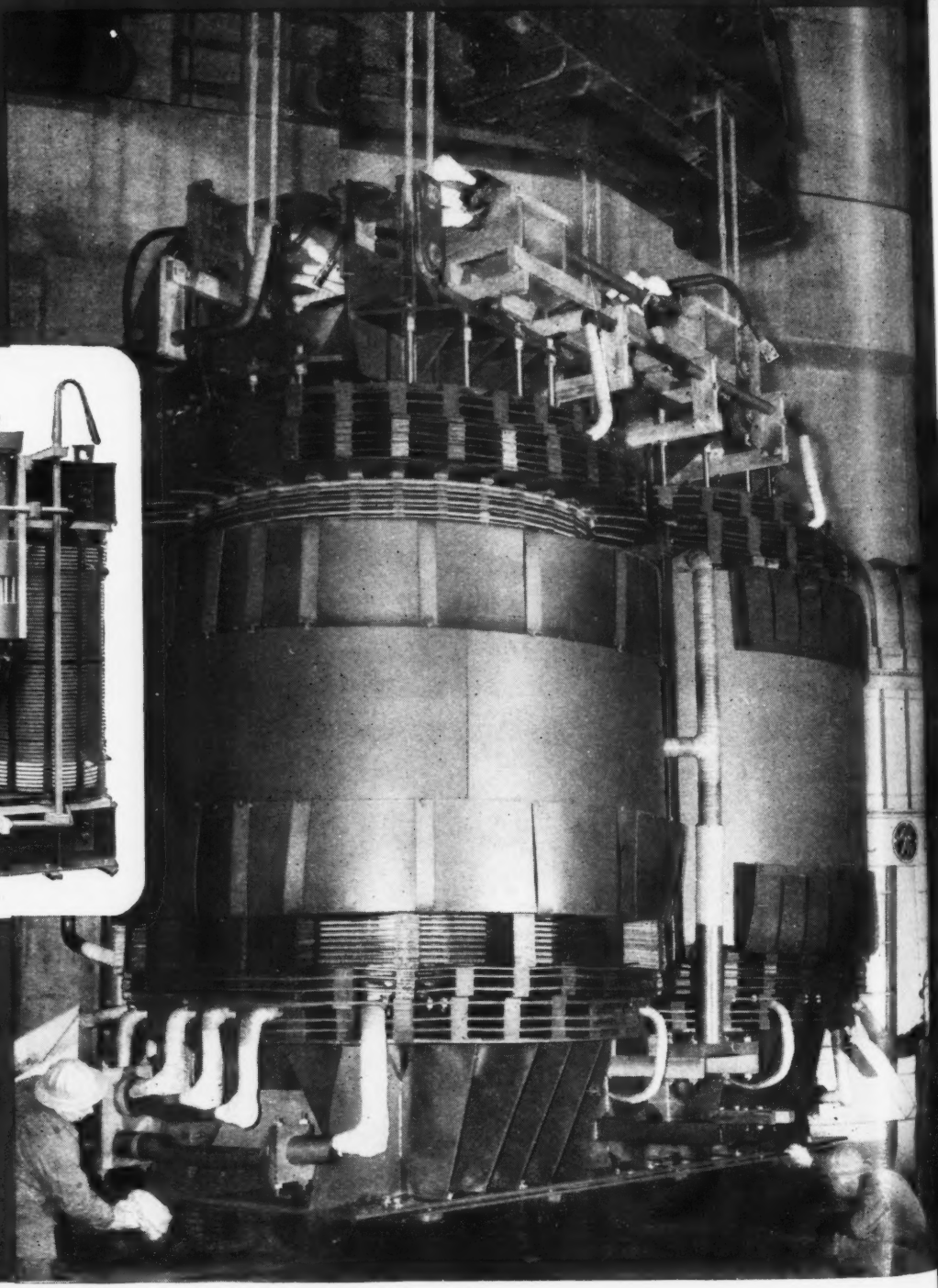
Pacific Coast Distributors
LOS ANGELES
E. M. Ornitz

SEATTLE
Geo. Montgomery

SHIELDED WINDINGS

TWO TYPES OF SHIELDING: (Right) Single-phase, 36,000-kva, 230,000-volt transformer with shields surrounding high-voltage windings. (Below) Single-phase, 26,600/-46,000Y-volt transformer with shields at top and bottom of each high-voltage coil stack.





GE

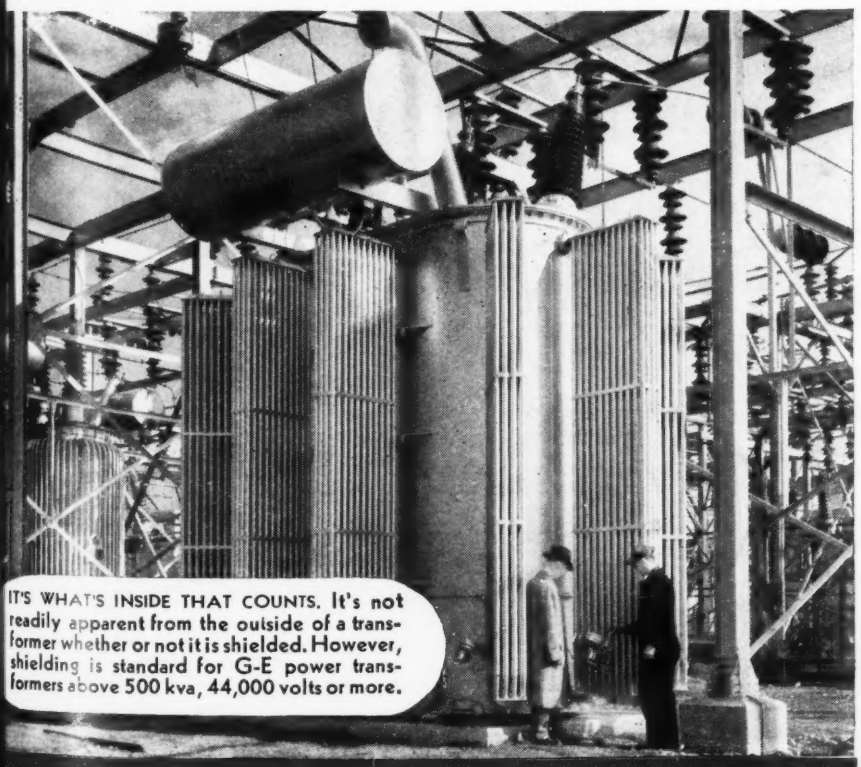
POWER TRANSFORMERS

for Real Protection of 3-SHIFT POWER for War Production

2500 IN SERVICE Wherever G-E shielded-winding transformers are supplying power—for the production of vital war goods or for the home—they are helping to ensure service continuity.

The G-E shielded winding has proved to be the most nearly perfect means yet devised for preventing concentrations of voltage stress within power transformers, which might be caused by switching surges or lightning impulses. Shielding enables the transformer designer to know definitely the maximum stress for which he must insulate at each point throughout the winding.

More than 2500 G-E shielded transformers, totaling more than 21,000,000 kva, installed over a period of 16 years, are now serving the war effort. *General Electric Company, Schenectady, N. Y.*



IT'S WHAT'S INSIDE THAT COUNTS. It's not readily apparent from the outside of a transformer whether or not it is shielded. However, shielding is standard for G-E power transformers above 500 kva, 44,000 volts or more.

GENERAL ELECTRIC

401-14-5155

What Is a Shielded Transformer?

A transformer is called "shielded" when its winding is equipped with properly insulated metallic surfaces, ***connected to the line terminal,*** and so proportioned as to effect a radical reduction in the lightning stresses inside the winding.

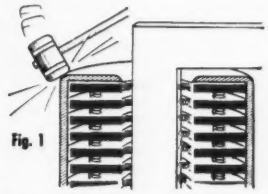


Fig. 1

Why Does Shielding Reduce Lightning Stresses?

Fig. 1 illustrates the effect of a sudden blow on a brittle mechanical structure protected by a steel shield that envelops the corner of the structure. The shield distributes the force of the blow over a sufficient area to ***prevent concentration*** of stress at any point, enabling the structure to stand, without damage, a blow that would otherwise be destructive. In a similar way, the shield shown in Fig. 2 envelops the corner of the transformer winding and ***prevents concentration*** of lightning voltage.*

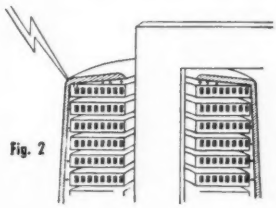


Fig. 2

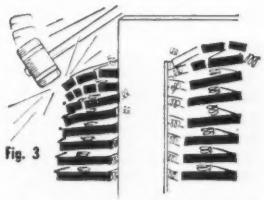


Fig. 3

In Fig. 3, the same mechanical structure, but without shield, is destroyed by a blow of the same severity, because of ***concentration*** of mechanical stress at the point of impact. This compares with the unshielded transformer winding subjected to lightning impulse, as shown in Fig. 4.

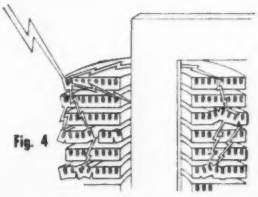


Fig. 4

The G-E shielding principle is as simple as it is effective. External application of the shields permits the retention of all the desirable features of G-E circular-coil construction. For a complete description ask for Bulletin GEA-2305.

**Voltage concentration* at the end *of the winding also causes internal oscillations which produce high-voltage concentrations within the winding, comparable in severity with the initial impact. These oscillations, too, are prevented by shielding.*

VARNISHED CAMBRIC . RUBBER POWER CABLES . BUILDING WIRE . RADIO WIRES . SIGNAL CABLES . FLEXIBLE CORDS . FAIRWAY AND FARM-FENDAS . CABLES . ARMORED CABLE . CRESFLEX NON-METALLIC SHEATHED CABLE . SERVICE ENTRANCE CABLE . MAGNET WIRE . BARE WIRE

You'll find SAFETY and SATISFACTION in these

CRESCENT

Building Wires and Cables

CRESCENT Building Wire

Under latest government regulations, no crude rubber is used in the manufacture of these wires, yet through the substitution of plentiful Buna S Synthetic Rubber they retain the inherently superior moisture-resistant, long-life properties of rubber insulation. They carry Underwriters' Laboratory labels, and are approved under the National Electric Code for *all interior wiring systems*, and are the most available wires in wholesalers hands at present and for the duration.

"CRESFLEX" Non-metallic Sheathed Cable

WAR PRODUCTION 100%

CRESCENT INSULATED WIRE & CABLE CO.

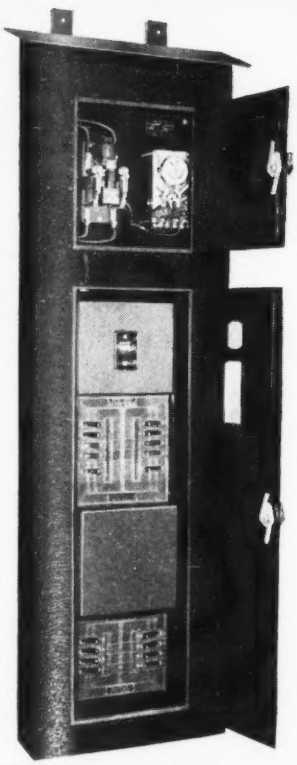
CRESCENT WIRE and CABLE

Factory: TRENTON, N. J.—*Stocks in Principal Cities*

CRESCENT ENDURITE SUPER-AGING INSULATION . WEATHER-PROOF WIRE

Airport Electrical Equipment

PANELBOARDS SWITCHES CIRCUIT BREAKERS DISTRIBUTION SYSTEMS STANDARD & "TAILOR MADE"

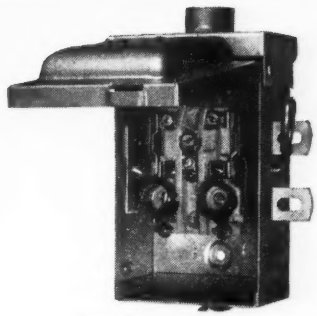


Basic airport control panel, an example of Square D tailor-made equipment. Provides automatic timing feature and remote control.

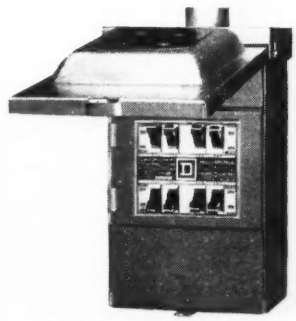
MANY of Square D's standard devices are ideally suited for airport installations—indoors and out. Special equipment for individual applications is built on a "tailor-made" basis under the direction of a staff of experienced design engineers.

You'll find your nearest Square D Field Engineer a source of sound counsel in determining exactly the right equipment for any given application. Keep him in mind during the current airport building activity—and in the days ahead when aviation spreads its peacetime wings.

SQUARE Duct, for flexible power distribution. Easy to install. Neat in appearance. Economical.



Raintight safety switch, one of many models and types.



Raintight circuit breakers are available in a wide range of sizes and capacities. They afford modern convenience and protection—eliminate fuses completely.

ELECTRICAL EQUIPMENT • KOLLSMAN AIRCRAFT INSTRUMENTS

SQUARE D COMPANY

LOS ANGELES • DETROIT • MILWAUKEE

WHEN OUNCES FEEL LIKE POUNDS

*Reg. U. S. Pat. Office

1230 SIXTH AVENUE
ROCKEFELLER CENTER, NEW YORK

UNITED

ND..ASSAULT TROOPS USE LAYTEX*

You know how it is. You slog along all day under full equipment. At first you don't mind the weight very much. But as the hours crawl along, everything you're toting gets heavier and heavier. The canteen you didn't notice in the early stages now weighs as much as your rifle did then. And your rifle feels like a howitzer. Every ounce turns into a pound.

That's why . . . when you're moving fast and the going is tough . . . it's smart to use Laytex Assault Wire.

A full mile of Laytex Assault Wire weighs less than 30 pounds.

Laytex Assault Wire has a breaking strength of 50 pounds per conductor and a talking distance of more than 5 miles.

Laytex resists concussion and a wide range of temperature changes.

It is flexible and waterproof, strong and tough

Conductors are accurately centered and the weight of insulation and the diameter of the insulated conductor are kept at the minimum.

All this adds up to the fact that one man, wearing a breast reel of Laytex Assault Wire can move swiftly and easily. One man can maintain sure communication with operational headquarters.

Listen to the Philharmonic Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.

VENUE
NEW YORK

TED STATES RUBBER COMPANY

There's No Substitute for Quality

Lloyd Products

are designed and engineered for perfect fluorescent performance.

Patent Nos. 2200443—2228210

Listed and approved by Underwriters' Laboratories Inc., and Canadian Engineering Standards Assoc.
Starters FS-2 and FS-4 certified by Electrical Testing Lab. Spec. 6.
Certified to Fleur-O-Lier Standards

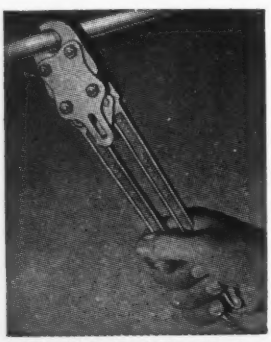
Lloyd Products Company
Gordon Avenue Providence 5, R. I.

This gives you some idea of the difference in efficiency and RESULTS—when you use the ultra-modern BRIEGEL METHOD of making thin wall conduit connections instead of many old-fashioned methods still on the market.

You conserve critical steel—Briegel fittings are made with 25% less steel than any other fittings on the market.

You save time—just two squeezes with the patented B-M "indenter" (illustrated at left) and a smooth, clean connection is made. No extra turns or twists—no nuts to tighten. Up to 50% saving on precious time!

You save materials—fewer items to buy and handle. MORE PROFIT ON EVERY JOB!



The Only Tool You Need
(Costs just $1.25)

Approved by Underwriters' Laboratories.
Prompt Deliveries on All Properly Rated Orders!

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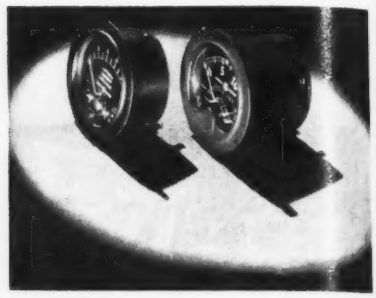
Youngstown, Ohio
Enameled Metals
Pittsburgh, Pa.
National Enameling & Mfg. Co.
Pittsburgh, Pa.
Triangle Conduit & Cable Co.
New Brunswick, N. J.

BRIEGEL METHOD TOOL CO., Galva, Ill.

Panel Instruments (1003)

General Electric Co. has a new line of small, thin d-c panel instruments featuring an internal-pivot construction and designed for use in aircraft, radio and communications equipment, and for application on various types of machinery. The new line consists of d-c voltmeters, ammeters, milli-



ammeters, microammeters, radio-frequency ammeters and milliammeters and d-c volt-ammeters.

Pivots are solidly mounted on the inside of the armature shell instead of on the outside of the armature winding. One jewel bearing is mounted on top of the core-and-frame assembly and the other is mounted in an adjustable sleeve fitted into the lower part of the soft-iron core. All parts of this self-contained unit are supported by a high-coercive cast magnet.

The manufacturer reports that these instruments will operates satisfactorily in temperatures ranging from —50° C. to 70° C. and are accurate to within the limits of plus or minus 2% of full-scale value.

Plastic Lighting Units (1004)

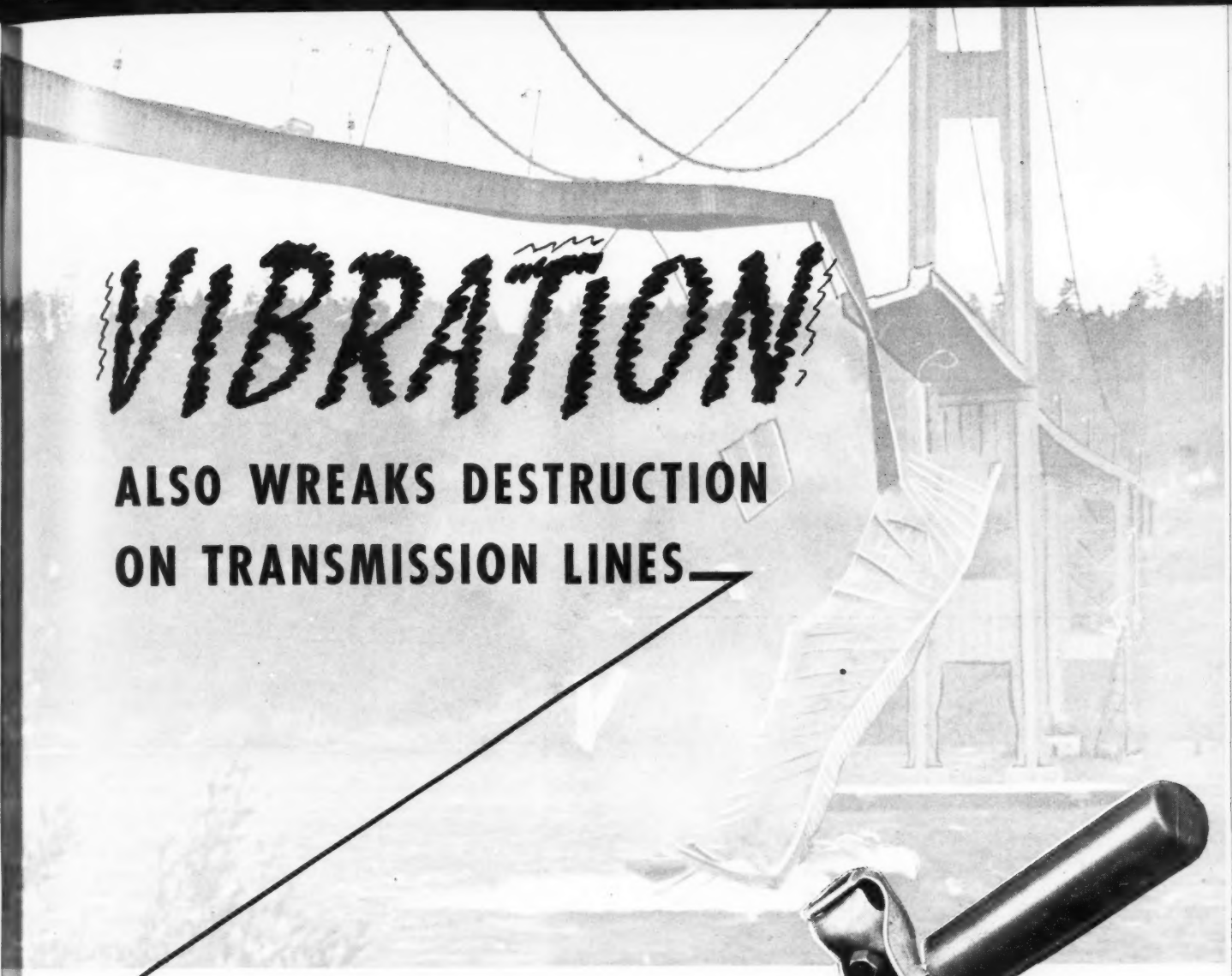
For the duration, Wakefield Brass Co. will manufacture the Chase line of plastic lighting units. These units are offered in two styles—the Commander, in wattages from 200 to 750 watts, and the Alden.

Plaskon, an urea formaldehyde plastic, is used for the reflecting medium. Its weight

is approximately one-quarter of that of other reflecting mediums of comparative size and it is not subject to breakage due to temperature changes, it is stated.

Lampholder (1005)

C. D. Wood Electric Co. has developed a water-tight lampholder, of keyless composition base, and rated at 660 watts, 250 volts. This lampholder has double contact screw terminals on each side, avoiding the necessity of soldering and taping wire joints in the box. The socket is designed for use under severe conditions. Diameter 2¼ in.; height above surface mounting ⅞ in.; four screw holes on 2-5/16-in. circles.



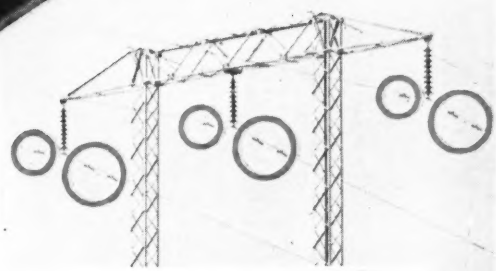
VIBRATION

ALSO WREAKS DESTRUCTION ON TRANSMISSION LINES—

—damp it with *STOCKBRIDGE DAMPERS

*Patented

Intense resonant oscillation under the cumulative effect of undamped rhythmic forces was accountable for the collapse of the Tacoma Narrows Bridge. So, too, in the case of overhead conductors, dynamic air currents and cross winds can wreak destruction by causing fatigue breaks of conductor strands at points of support. This destructive force can be arrested with Stockbridge Dampers, installed a measured distance from the insulator ties. Stockbridge Dampers absorb the energy of incipient vibrations and preclude the build up of amplitude. Installation is readily made with hot-line tools without interrupting service or disturbing existing suspension or dead-end damps. Contact your nearest branch of General Electric Supply Corporation or Graybar Electric.



Illustrations at right depict two types of installations embodying Stockbridge Dampers.

HUBBARD

Hubbard and COMPANY

OAKLAND, CAL. PITTSBURGH CHICAGO

HANG THE LOAD ON HUBBARD HARDWARE

HUBBARD

Accuracy: + or – 6 inches

..How "*See-ability*" is helping skilled workmen produce range finders of amazing accuracy for the U. S. Army

They said it couldn't be done!

No sir, no one could turn out range finders, eyes for our army's artillery—as accurate as it wanted them—*as fast as it must have them!*

But that was a long while ago—before Pearl Harbor!

Today, Industry is in quantity production on range finders almost *absolute* in accuracy.

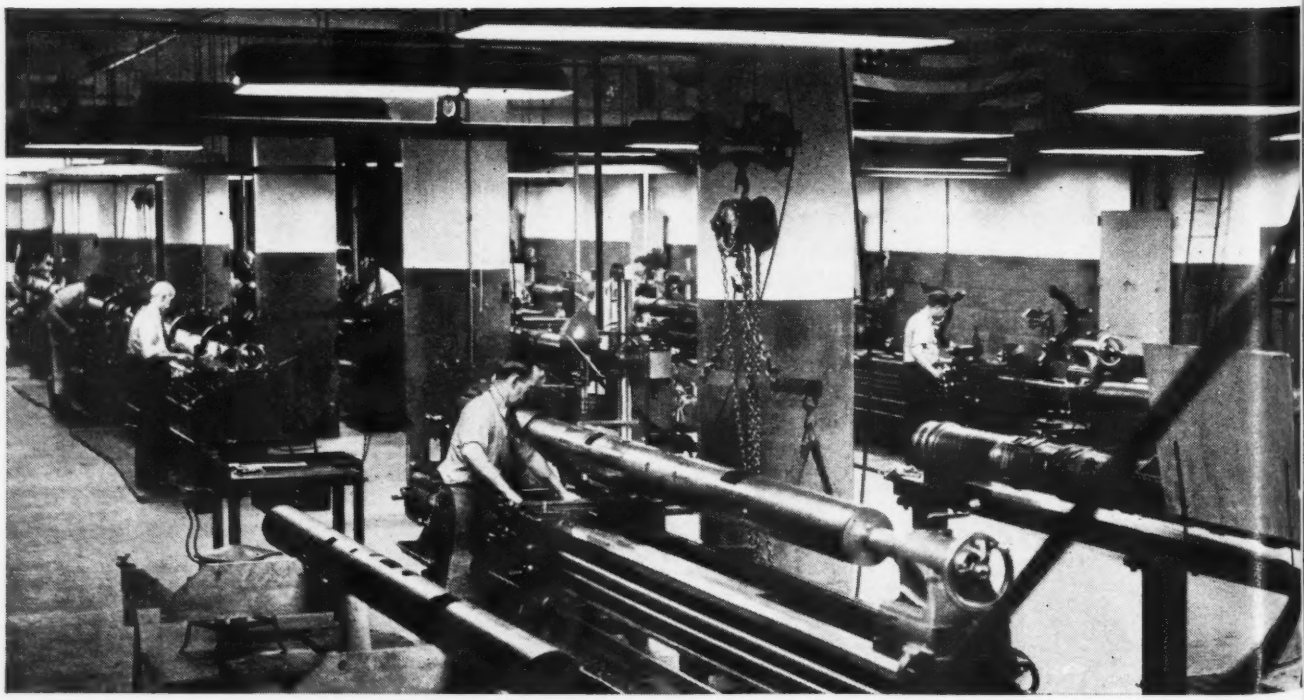
Today, thanks to American *know-how,* gunners all over the world, smack their targets right on the nose!

"See-ability" through better, more scientific lighting helps make this miracle possible. It is helping make high speed precision machine work a routine matter. It is helping bring well-nigh superhuman skill to human eyes and fingers.

That is why millions of Westinghouse Mazda Lamps are ear-marked to bring "See-ability" to this and other vital war work.

More light for war plants! In many factories, equipment is showing the strain of continuous, round-the-clock production. Especially lighting systems! You can help these plants get more light. Send for free booklet, "See-ability for Indoor Eyes." It is full of valuable suggestions. Westinghouse Electric and Manufacturing Company, Lamp Division, Bloomfield, N. J. *Plants in 25 cities . . . offices everywhere.*

KEEP YOUR DOLLARS FIGHTING . . . BUY WAR BONDS



at better than 5,000 yards!

Westinghouse
MAZDA LAMPS
FOR BETTER "SEE-ABILITY"

3 Electrical Huskies

to handle every light and power job

BULLDOG
ELECTRIC PRODUCTS CO.
Detroit, Michigan
BullDog Electric Products of Canada, Ltd., Toronto, Ontario
Field Engineering Offices in All Principal Cities
MANUFACTURERS OF a complete line of Vacu-Break Safety Switches, Panelboards, Switchboards, Circuit Master Breakers and BUStribution SYSTEMS.
You SAVE What You SPEND for WAR BONDS

BUStribution DUCT for Flexible Power

Built in standard, interchangeable 10-foot sections, BullDog BUStribution DUCT provides *complete flexibility* for power and lighting circuits. The "Plug-in" Type enables you to change production machine set-ups at will — rearrange whole departments without interrupting production elsewhere.

The new LO-X *Ventilated* Feeder Type Bus Duct delivers more power with less voltage drop. The screened casing prevents excessive heat, cuts weight and improves appearance.

BUStribution DUCT is an integral part of the machines it serves. It is quickly and easily installed — 100% salvable — makes sensational savings in maintenance.

(Conforms fully with WLB Limitation Order L-273)

INDUSTRIAL TROL-E-DUCT for Feeding Portable Tools

This thoroughly modern method of power distribution is equally valuable where portable electrical tools are an important part of the production line.

With Industrial Trol-E-Duct, the source of power moves along with the tool — cutting operating cost, eliminating interruptions due to fixed plug-in points, increasing both safety and productive time, and making extensive savings in wiring and other fixed equipment.

A fully descriptive bulletin will be sent on request.

UNIVERSAL TROL-E-DUCT for Flexible Lighting

What Industrial Trol-E-Duct is to power, Universal Trol-E-Duct is to lighting. It is a flexible system of *movable outlets* by contrast to the old, limited system of fixed outlets.

Universal Trol-E-Duct puts light where it belongs — close to the work. It enables you to meet instantly any change in your lighting set-up or requirements, simply by moving lights along the duct or by adding new lights where needed.

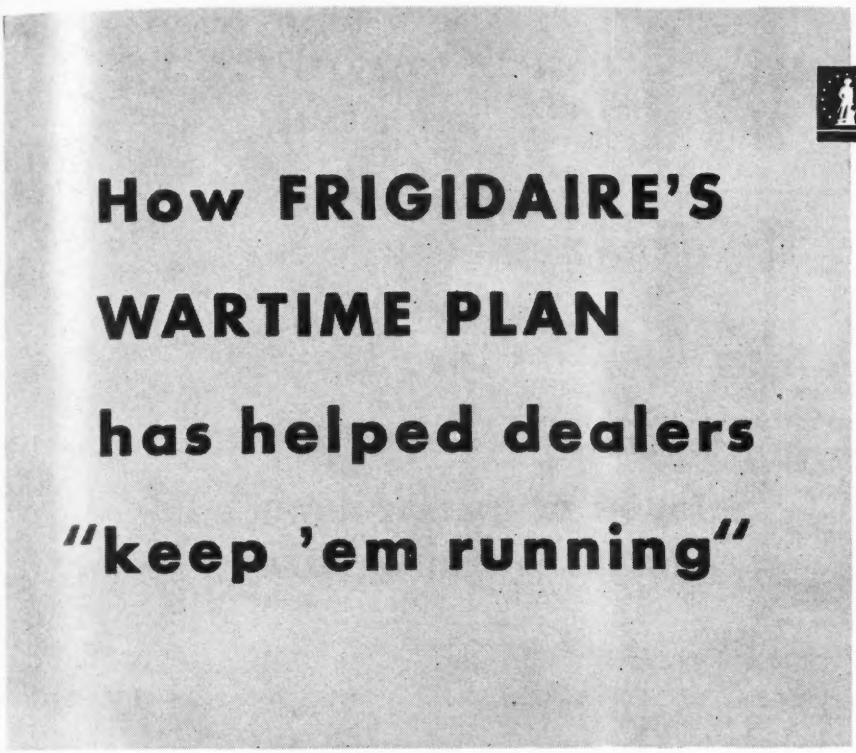
Ask for full information about these and other BullDog electrical products which are serving industry, large and small.

BULLDOG PRODUCTS ARE SOLD AND DISTRIBUTED BY THE FOLLOWING PACIFIC COAST REPRESENTATIVES:

Coast Electric & Manufacturing Co.
1720 N.E. Sixth Avenue
Portland, Oregon, Tel. Garfield 2844

Safety Switchboard & Manufacturing Co.
1445 Stevenson St.
San Francisco, Calif., Tel. Hemlock 2470

Mullenbach Electrical Manufacturing Co.
2300 East 27th Street
Los Angeles, Calif., Tel. Jefferson 2224



Back the Attack—
with War Bonds

How FRIGIDAIRE'S WARTIME PLAN has helped dealers "keep 'em running"

EARLY in 1942, when it became apparent that existing refrigeration equipment could not be replaced, Frigidaire intensified its efforts to help dealers solve the many problems confronting them.

Because this Wartime Conservation program was based on the wide experience of factory specialists, as well as actual experiences in the field, it has been unusually successful. Covering all phases of service activities from factory to user, it has helped Frigidaire dealers perform an outstanding service job during a very critical period.

Moreover, the Wartime Conservation program is not a one-time affair. It is of continuous help, with up-to-the-minute information and suggestions constantly flowing to the field organization as new problems arise. Here are a few of the reasons why Frigidaire dealers are so enthusiastic about this program:

Factory-Conducted Meetings have been held in all parts of the country to acquaint dealer and district personnel with first-hand details of the Conservation program. Factory specialists are also in touch with the field constantly to lend assistance wherever and whenever they can.

District Meetings and other means have been used to show dealers how to set up an inexpensive service shop; how to conserve time and expense by proper diagnosis of service complaints; how to conserve parts by repairing instead of replacing; how to build customer good will; and how to maintain identity as service headquarters.

Field Training Schools conducted by factory and district instructors have been of great assistance. Hundreds of new and experienced servicemen have received fundamental and advanced training in Household Refrigeration, Commercial Refrigeration, and Electric Range work. Night School classes have been very popular.

A Correspondence Course, over a period of 16 weeks, has had an enrollment of more than 5,000 students. This course embraces Household and Commercial subjects, from basic to advanced information. Personal aid and encouragement are given to each student by district service specialists when grading lessons.

Training Films have been made available to help new servicemen and to "refresh" veterans. Films cover such subjects as "Changing Sealed Rotary Units in Various Style Cabinets," "Service Operations on Household Reciprocating Systems," "The Easy Way to Service and Diagnose the Sealed Rotary System," "Service Operations on Ice Cream Cabinets," and "Servicing Wet Storage Beverage Coolers."

Handy Reference Guides help new servicemen and veterans alike. These easy-to-follow pocket size manuals have proved to be invaluable aids to more intelligent and quicker diagnosis.

Factory Bulletins and the dealer newspaper, the BTU News, are issued regularly to keep the service organization abreast of latest service developments. They also publicize the successful experiences of others and tell the "what, why and how."

Adequate Parts for keeping millions of Frigidaires operating are an important factory responsibility. A large Parts manufacturing department produces, repairs and feeds parts to depots strategically located throughout the country. From there they are distributed to servicing dealers.

Conservation of Critical Materials, affecting the manufacture of hundreds of parts items, has been an important means of assuring the parts and assemblies needed by Frigidaire's servicing dealers.

A continuous major program to help dealers accomplish these 5 important objectives

1. To cooperate with the Government's Food Conservation and Health Protection Program.
2. To help keep the millions of the nation's refrigerators running.
3. To help dealers locate and train necessary service manpower.
4. To help dealers obtain essential service parts.
5. To help dealers build good will and maintain income.

For Excellence in War Production

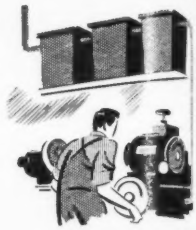
Every Sunday Afternoon: GENERAL MOTORS SYMPHONY of THE AIR, NBC Network

FRIGIDAIRE Division of GENERAL MOTORS

Peacetime builders of Home Appliances, Commercial Refrigeration, Air Conditioners

LIGHT

ENOUGH TO MOUNT ON A SHELF



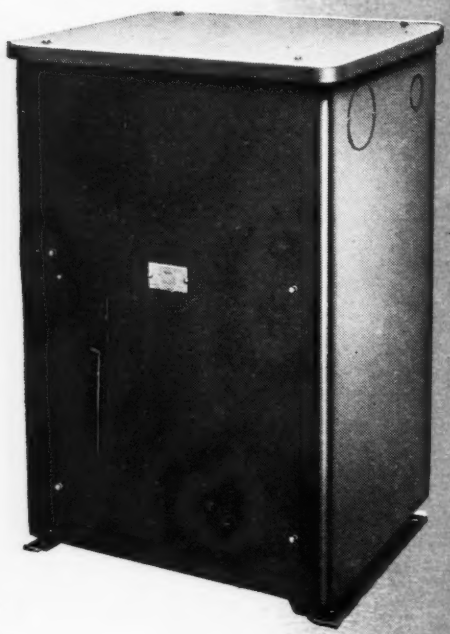
SMALL

ENOUGH TO FIT ANYWHERE NEAR THE LOAD CENTER

SAFE

ENOUGH TO INSTALL RIGHT IN THE WORKING AREA

Westinghouse DRY-TYPE Transformers are available in ratings of 15 kv and less; 500 kv-a single or three-phase. Illustration shows a 600-volt, 25 kv-a, Type AVR.



Westinghouse DRY-TYPE DISTRIBUTION TRANSFORMERS

Here's the smallest and lightest distribution transformer ever built . . . the new Westinghouse DRY-TYPE Transformer. It saves 36% of the copper and 50% of the steel previously required—and is a *better transformer.*

CONSERVES TIME . . . because no fireproof vault need be constructed. It is completely free from fire and explosion hazard.

CONSERVES POWER . . . because location at load center improves regulation, reduces length of heavy copper secondary cable runs.

CONSERVES MANPOWER . . . because maintenance is practically eliminated. There are no liquids to inspect, change or filter.

CONSERVES SPACE . . . because this drip-free unit can be mounted anywhere indoors—on a shelf, a post or overhead on a beam.

Three factors are responsible for this increased efficiency: (1) Class B Insulation (80°C. rise) which permits more kv-a output with less copper in the windings. (2) Hipersil*, the new Westinghouse electrical steel that has one-third more flux-carrying capacity. (3)"Know-how" of Westinghouse engineers in developing and using new materials. Your Westinghouse representative can give you complete details. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-70412

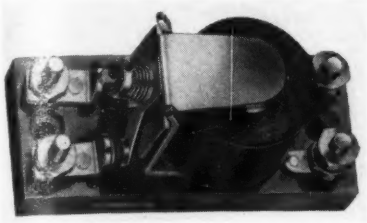
**Registered trade mark, Westinghouse Electric & Manufacturing Company, for HIgh PERmeability SILicon steel which carries ⅓ more flux.*

Westinghouse DISTRIBUTION TRANSFORMERS

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Aircraft Contactor (1006)

A 25 amp. Type B2A aircraft contactor manufactured to meet Army Air Force specification No. 94-32185D has been announced by Square D Co. as an addition to a line previously including 50, 100 and 200 amp. sizes. According to the manufacturer, the new contactors may be used for remote



control, starting and stopping d-c motors, or as relays in gun fire, lighting or communication circuits.

The unit weighs seven ounces and is rated 25 amp. continuous duty for potentials up to 29 volts d-c. The contactors will operate successfully under acceleration forces up to 10G or vibration conditions as severe as 55 cycles per second at 1/16 in. excursion, the announcement states. They are said to be suitable for operation through a temperature range of −65° F. to +160° F. and to be undamaged when exposed to temperatures of −75° F. to +200° F.

Selector (1007)

The Paul Henry Co. has designed an aircraft selector switch incorporating snap action. This switch is made with from one to four primary circuits and twelve secondary circuits, according to the announcement, and wide latitude of application is possible. Opening and closing of a circuit is accomplished within three or four degrees motion of the cam, it is claimed by the manufacturer, who states that a conservative current rating for 50,000 operations is 10 amp. at 29 volts inductive load. Used as a selector switch, it can be mounted singly or in gang and operated by a single shaft. Any type of cam-operating member can be incorporated, it is stated.

Stud Welder (1008)

Union Supply & Mfg. Co. is offering a stud welder, which it claims welds studs or pads by combining arc welding with a high amperage flash method of welding. Power is obtained from a 440-volt service fused at 200 amp. A transformer built into the machine supplies welding power. The machine has a mechanical timing device; operates two guns from one unit. Weight, 550 lb.

F Lamp Ballast (1009)

Industrial Electronics Corp. has announced a plug-in fluorescent lamp ballast with a "Perma-Gap," containing a non-metallic alloy. According to the manufacturer, these ballasts control the flow of current into the lamp as close as 99.99%, preventing deterioration of the cathodes and emission coating.

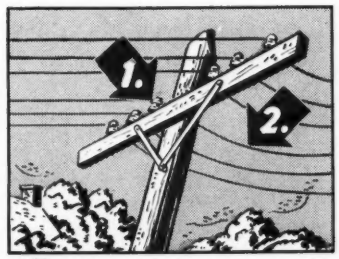
Cable Connector (1010)

Jackson Products has announced a cable connector designed for arc welding. Features claimed by the manufacturer are tight lock, quick unlocking and full insulation.

DANGER LINES

Regular Pole Inspection is a Preventive

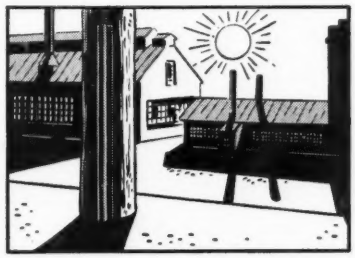
A single defective pole may result in a dual power failure. If power failure occurs at either points 1 or 2, production in nearby war plants will be at a standstill. And, all for the lack of regular pole inspection which would have indicated the need for a proper-weight guy wire to give this pole the support it needs to keep it firm and straight, ease the tension on one side, take up dangerous cable slack on the other.



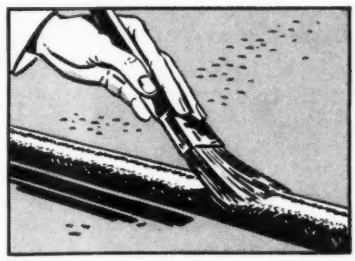
1. Cable connections at this point are in danger of being completely disconnected.

2. These slack cables may whip together in the wind and arc.

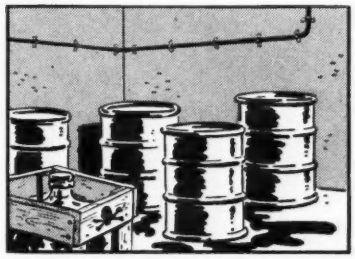
"PUTTING THE BEE" ON WAR PLANT CABLE FAILURES—OUTDOORS



1. Run wiring in shadiest place possible—such as north side of pole, pipe, or building, or under side of a bridge. Sun and heat are insulation saboteurs.



2. Place wiring where it will not come into contact with oil or acid. Insulation may be damaged—failure result.



3. Apply weatherproof coating to cable sheathing every year or two, sealing moisture out, adding years to cable life.

ROEBLING PRODUCTS are built for long life. Give them the care they deserve, they'll pay dividends in extending satisfactory operating service.

GALVANIZED STEEL GUY STRAND

ROEBLING URC weatherproof wire and cable for overhead power lines and distributor circuits for carrying light and power to the mine, industrial plant, or home.

JOHN A. ROEBLING'S SONS COMPANY OF CALIFORNIA

San Francisco Los Angeles Seattle Portland

ROEBLING

ELECTRICAL WIRES AND CABLES

INCOMPLETE UNION between successive charges resulting from ordinary filling methods causes structural imperfections and results in sheath failure. (The lower portion of the lead "slug" section shows the crystals of smaller grain size since this is the residue of previous charges and has been subjected to great extrusion pressure.)

CABLE-SHEATHING PRESS—cut back to show the Hill Standpipe in action while it unites successive charges of lead.

COMPLETE UNION of charges is obtained by the combination of stabilized lead (free from oxides and harmful impurities) and the Hill Standpipe method of bottom filling. This filling from the bottom assures uniform knitting of old and new charges . . . thus eliminating the cause of laminations.

THROUGH OKONITE-CALLENDER RESEARCH . . .

YOU CAN HAVE PAPER CABLES WITH UNIFORMLY STRONG LEAD SHEATHS

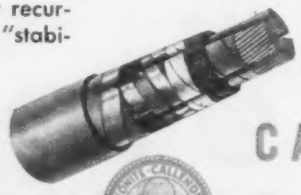
Laminations and inclusions . . . the most common causes of lead sheath failures in service . . . are attributed to inability to control several variables, including the uniformity and chemical purity of the lead and the methods used in applying it to the cable.

A series of Okonite-Callender research developments have supplied methods for controlling these factors. Foremost among these—

1. We can control the uniformity and arrangement of the lead crystals by chemical treatment. **2.** We remove original impurities, and at the same time prevent their recurrence during the lead sheathing operation by "stabilizing" the lead through our sodium treatment. **3.** We obtain complete union between successive charges of the lead press by using our Hill Standpipe method of press-filling (as shown above).

Some of these developments were made part of regular factory procedure at least 7 years ago. *Since their adoption not a single lead sheath failure due to laminations or inclusions has been reported for any Okonite-Callender cable.*

Additional methods have been introduced as further research demonstrated their usefulness. And current research is revealing new data that will lead to even greater improvements in the lead sheathing of paper cables. The Okonite-Callender Cable Co., Inc., Passaic, N. J.



OKONITE CALLENDER

PAPER INSULATED POWER CABLES

thanks to Graybar's Procurement Know-How!

Reports from the fighting fronts, reaching a builder of one of America's pursuit ships, showed the need for a change in the cockpit lighting fixture, a small item, but one of vital importance in emergencies.

Recalling Graybar's fine record in meeting other difficult lighting problems, the plane-builder asked for our help. It meant developing a brand new unit, tooling up, and beginning quantity shipments in just about 60 days!

From its list of lighting suppliers, GRAYBAR picked a firm with the right background and facilities for this particular job. A design engineer arrived overnight, and "pitched in" with the plane builder's men and the GRAYBAR Lighting Specialist.

Just two weeks later he was back with samples of a new design, a design which met the thorough tests with flying colors. The production order followed immediately. In less than 30 days thereafter, the plant was making deliveries in quantity.

Now repeat orders to GRAYBAR are confirming the fact that the new fixture design was "right on the beam". No less important — the new unit is priced some 30% below the former abandoned design!

More and more, GRAYBAR service to builders of war equipment is embracing items to be incorporated in their construction. Whether these are *standard* or *special,* mass-produced or built to order, GRAYBAR offers a fast-acting service of supply, backed by experienced specialists in procurement for aircraft, shipbuilding or ordnance.

MOBILIZING MATERIALS

No. 10 of a series of actual examples of GRAYBAR service, providing electrical materials to be installed in ships, planes and other war products.

Executive Offices:
GRAYBAR BUILDING
New York 17, N. Y.

GraybaR

IN OVER 80 PRINCIPAL CITIES

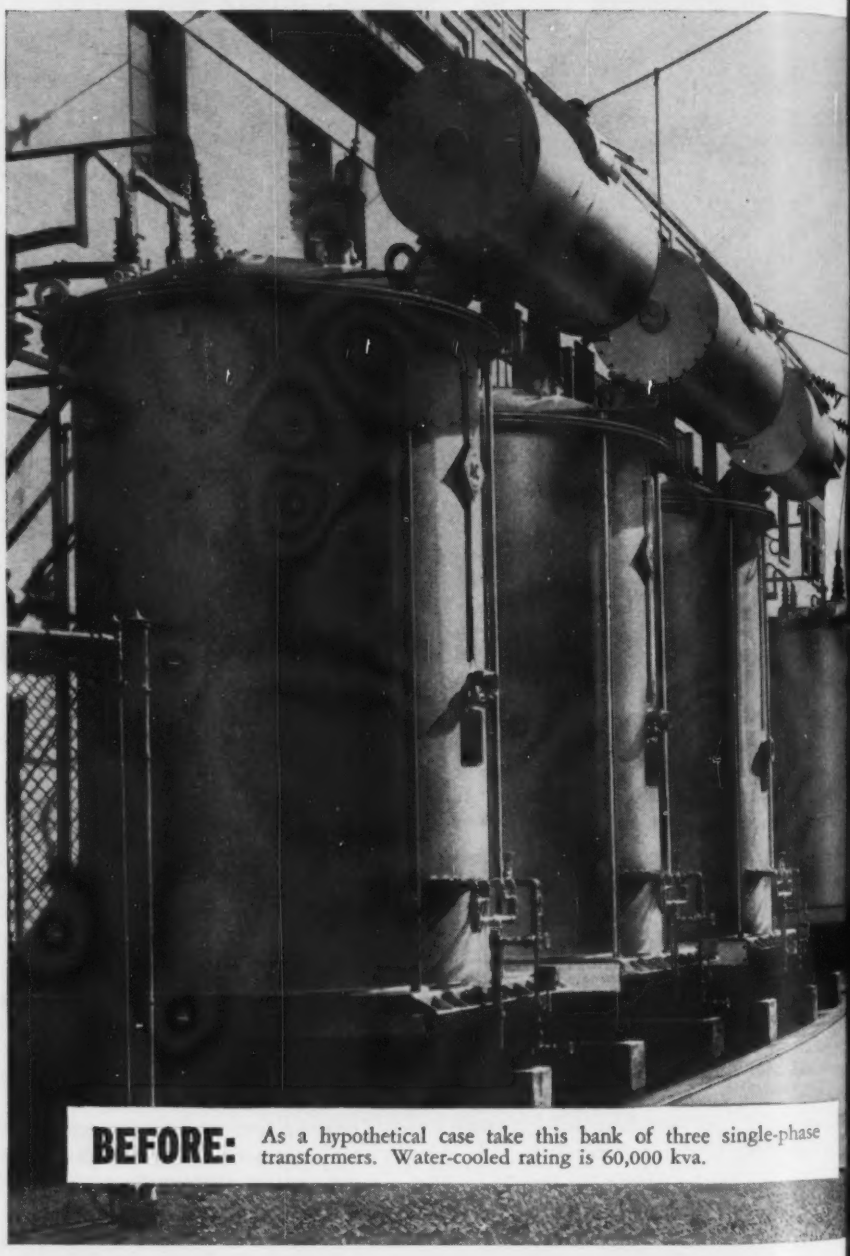
GraybaR Everything Electrical
. . . THAT IT TAKES TO WIN!

NEW ALLIS-CHALMERS ELECTRO-
OF YOUR POWER TRANSFORMERS
HERE'S FORCED-OIL COOLING

★ By accelerating flow of oil with pump action — and by forcing cooling air over radiator surfaces — ELECTRO-COOLERS jump present capacity of most power transformers by as much as 60%. Installation is simple and quick!

★ New transformers built with ELECTRO-COOLERS use 25% less critical copper and steel than formerly... and cost you correspondingly less!

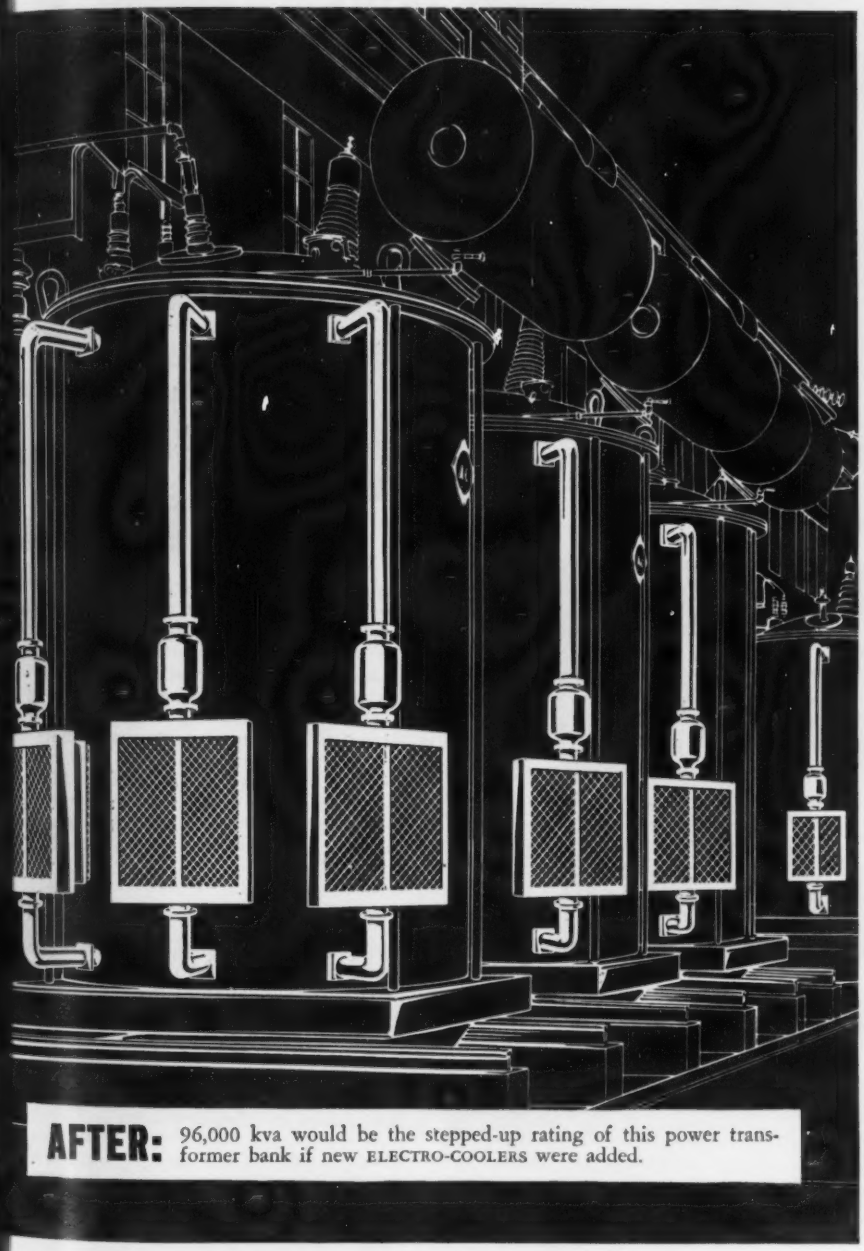
★ Allis-Chalmers new ELECTRO-COOLERS are self-lubricating... employ no glands or stuffing boxes ... are simple, sturdy, practical. Here's a wartime investment with a great peacetime future!



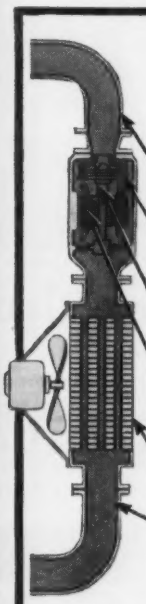
BEFORE: As a hypothetical case take this bank of three single-phase transformers. Water-cooled rating is 60,000 kva.

ALLIS-CHALMERS

COOLER CAN JUMP CAPACITIES 20-60% . . . AND IT'S PRACTICAL! AT ITS NEWEST AND FINEST..



AFTER: 96,000 kva would be the stepped-up rating of this power transformer bank if new ELECTRO-COOLERS were added.



Electro-Cooler Highlights

Factory assembled ELECTRO-COOLER shipped as a complete unit — saving time.

No glands or stuffing boxes to permit oil drips and air bubbles. No packing to fix.

Only one shaft! Motor and pump are designed as a complete unit—in one frame.

Simplicity! 3-phase squirrel cage motor has no starting brushes, commutator or other such wearing parts.

High-pressure test reduces possibility of oil leaks.

Self-contained and self-supporting! No foundation required.

WHETHER YOUR power transformers are water-cooled or self-cooled, new Allis-Chalmers ELECTRO-COOLERS can jump capacity 20-60%.

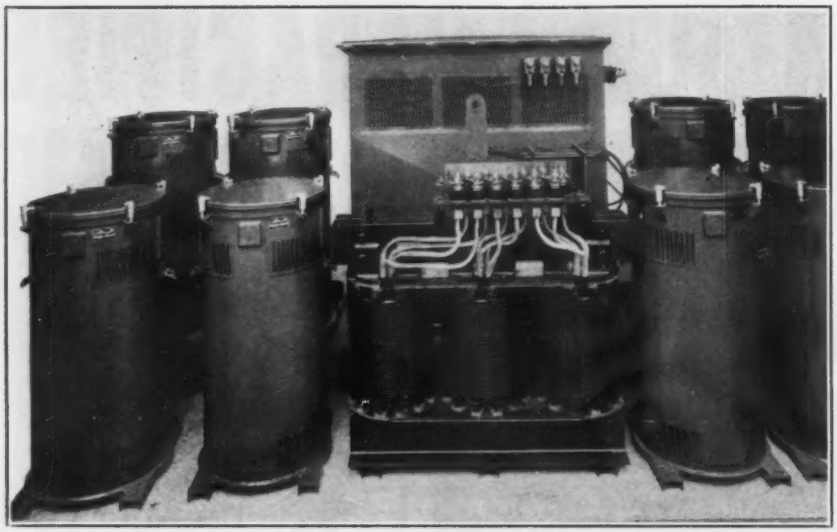
On water-cooled units ELECTRO-COOLERS eliminate water coils and coil service problems . . . reduce maintenance to a *minimum*.

Installation is simple because ELECTRO-COOLERS are self-contained and self-supporting.

For further information contact our nearby district office. Or write for bulletin B-6242. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 1640

TRANSFORMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE



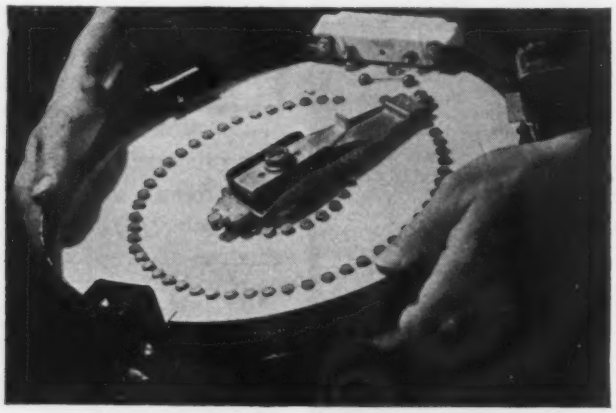
Center Air-Cooled Unit is 112½ KVA, 3 phase, 4000 to 120/240 volts—core and coil stands in front of completed tank to show construction. Air-Cooled Transformers on each side of center unit are 25KVA, 460/230 to 230/115 volts.

For efficiency, for smooth operation, for ease in handling—use GARDNER Air-Cooled Transformers. No extra cost for "stay-put" transformer vaults! No oil or any other patented filling medium necessary! No worry as to final location—they are easily rearranged as you expand or further modernize your plant!
Remove that added worry from your shoulders—let GARDNER Transformers, sturdily built to your specifications, provide the answer to your voltage problems. Write for full information.

Gardner Electric Mfg. Co.
4227 Hollis St. Emeryville 8, Calif.

Represented by

MAYDWELL & HARTZELL
INCORPORATED
SAN FRANCISCO LOS ANGELES SEATTLE



IT'S SUBSTANTIAL

Ward Leonard Pressed Steel Rheostats, properly installed and used, will outlast the machines they control. They are absolutely smooth in operation. They dissipate heat from both sides. Contacts are solid metal ground for perfect fit. These are but a few of their many advantages. Bulletin 60 gives full particulars. Send for a copy.

Pressed Steel Rheostats are made in 4" to 18", Ring types from 1½" to 4" inclusive.

ARMY E NAVY ARMY E NAVY

WARD LEONARD
RELAYS • RESISTORS • RHEOSTATS
Electric control (WL) *devices since 1892.*

WARD LEONARD ELECTRIC CO., 68 South St., Mount Vernon, N.Y.

Electronic Package Unit (1011)

Flashtron, an electronic package unit, is offered by Thordarson Electric Mfg. Co. According to the announcement, the unit is not in itself a control "system" but is the electronic nerve center for regulating variables in industrial processes—a sort of "buffer" control element operating between the primary sensitive element and the power operating control element.

It is claimed the unit can be operated from super sensitive primary actuating elements of many types and its output circuits accomodate the alternate energizing of loads within the range of the instrument which may be connected to it.

One of the two output circuits is always energized but both cannot be energized

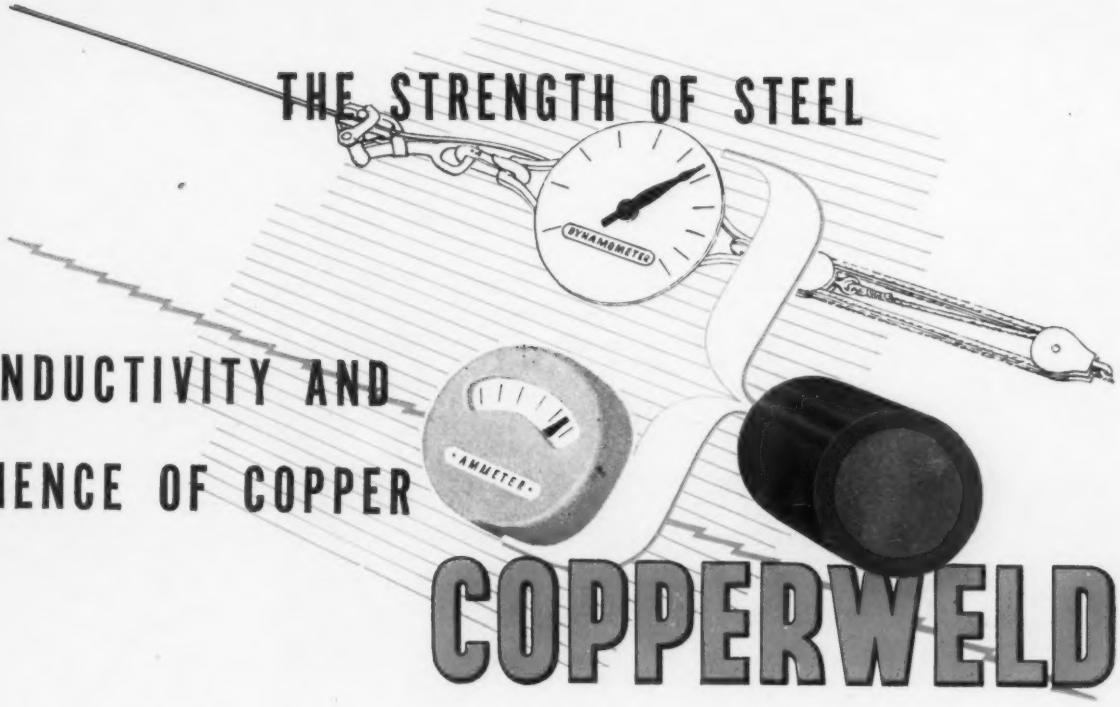
simultaneously with contactor type actuating devices. Since one or the other circuit must be in operating at any given instant, the valve will be constantly reset to the desired position in exact response to the performance of the primary sensitive element which is actuating the Flashtron unit. Although the unit cannot compensate or correct for lag in any of the other control elements in the system in which it is used, it does not in any way limit full utilization of the performance of any of these other elements, the manufacturer claims.

Photoelectric Control (1012)

A photoelectric system for accurate measurement and control of the density of transparent films, filters, plastics, gases and liquids has been developed by Photoswitch Inc. The unit projects two beams of light from a single light source. One beam passes through any standard filter; the other through the filter or liquid to be measured. The two light beams are then projected by an optical system to a single phototube. By means of an electronic and mechanical timing system, the device constantly measures the ratio of transparency of the sample as compared with the standard filter.

This device is supplied to meet individual transparency specifications and production control requirements, and measures materials up to density 5. The manufacturer states that for recommendations on a particular application, information is required as to the range of density or per cent transmission of the material to be measured, as well as a sketch indicating the manner in which the material is to be passed through the light beam.

THE STRENGTH OF STEEL

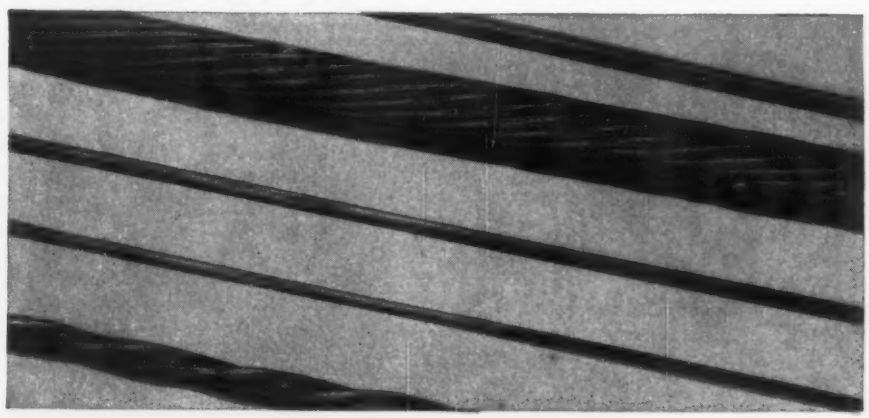


THE CONDUCTIVITY AND PERMANENCE OF COPPER

COPPERWELD

Copperweld wire derives its strength from its core of strong steel—steel permanently protected against rusting by a thick exterior of copper. The copper need only do the job that copper does best—provide *rust resistance and electrical conductivity*. The steel need only do the job that steel does best—*provide strength*. No other wire combines the strength of steel with the conductivity and permanence of copper.

Copperweld Steel Company GLASSPORT, PA.



Millions of pounds of Copperweld wire are used for communications on all our battlefronts.

Putting 'em Thru the Mill!

Strip for Action! Strip made from WILBUR B. DRIVER CO. special alloys! Strip that has so many essential war uses! As it is rolled through their mills, day and night, we know it will do its part in flattening the Axis!

Consult us for your special alloy requirements in rod, wire, ribbon and strip—both hot and cold rolled.

ELECTRICAL SPECIALTY COMPANY

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Whether your account is large or small, business or personal, checking or savings, you will find our Mailway service helpful. We have special facilities to make banking by mail easy and prompt. Our careful attention to your needs will enable you to bank with us by mail, at greater convenience to you.

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Manufacturers' Representative

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SIGNAL ENGINEERING & MFG. CO.
Relays—Bells—Horns—Code Call Systems Fire Alarm Systems

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CLARK-COOPER CO.
Air Sirens—Air Whistles

CANNON ELECTRIC DEV. CO.
Hospital Signal Systems—Motor Plugs Receptacles

TRICO FUSE MFG. CO.
Fuses, Oilers, Clip Locks and Fuse Pullers

KNOX PORCELAIN CORP.
Electrical Porcelain

Non-Critical Wire (1013)

Hazapak, a building wire containing no critical materials in insulation and protective coverings has been announced by the Hazard Insulated Wire Works division of the Okonite Co. The copper conductor is insulated with a synthetic tape and further protected with a heavy layer of moisture-proof compacted Kraft paper. Without rubber insulation, tin coating for the conductor is not necessary, according to the manufacturer.

The full NEC wall of insulation is protected by a flame- and moisture-resistant fibrous covering made to the Dilec specifications and the finished wire is approved by the Underwriters' Laboratories, the announcement states.

Hazapak Type EG (emergency grounded) building wire is approved for use as the neutral grounded conductor in a-c circuits and as the "white" conductor in cable assemblies such as non-metallic and armored cable, twin lead encased, etc., where WPB rubber restrictions prohibit use of rubber insulation on the white or grounded neutral conductor.

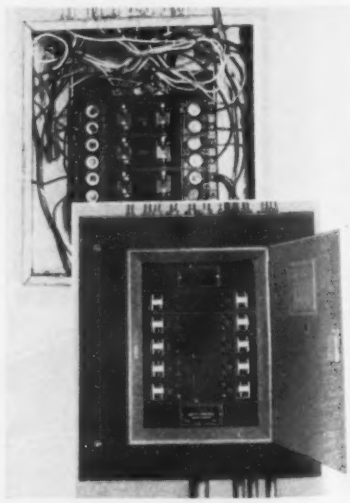
Hazapak Type EI (emergency insulated) is approved for single conductor in open wiring as a wartime alternate for rubber insulated wire and as the "hot" wire in non-metallic-sheathed cable that is run exposed in dry locations.

Available in all regular building wire sizes for 600 volt ratings and can be supplied in all standard colors with full surface identification markings and footage measurements.

Over-all diameters of Hazapak are the same as for Type R. wire and conduit capacities remain the same as for regular rubber-covered conductors, it is stated.

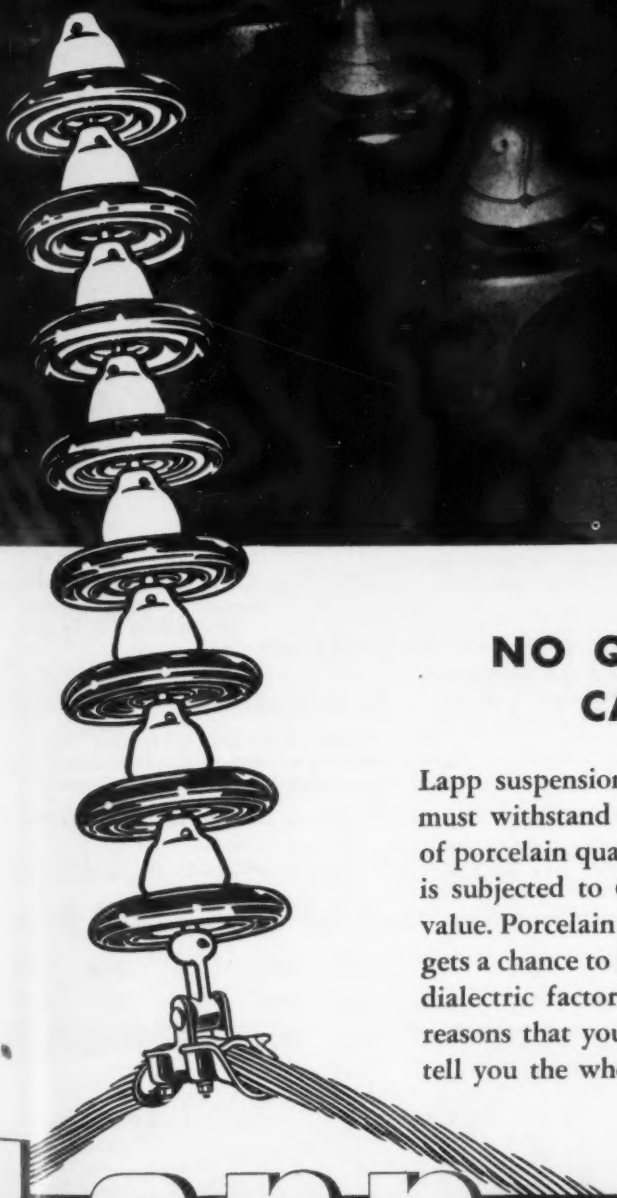
Panel Conversion (1014)

Square D Co. has announced its multi-breaker convertible panel plan for conversion of obsolete fusible panelboards to circuit breakers with increase in the number of circuits and in capacities. In some cases, the manufacturers claims, capacities of existing panelboards have increased as much



as 400% and the average increase is between 50 and 100%.

The old trim and interior are removed from the box and the existing wiring pulled out if it cannot be utilized. By employing thin-wall wire, the existing conduit may be wholly or partially used, it is stated.



NO QUESTIONABLE PORCELAIN CAN SURVIVE THIS TEST

Lapp suspension insulator units, before being approved for shipment, must withstand the Overpotential Test, the industry's most severe test of porcelain quality. Its rim immersed in oil to prevent flashover, the unit is subjected to 60 cycle current at voltage higher than rated flashover value. Porcelain not up to the Lapp standard, punctures in this test, never gets a chance to fail on your lines. Units that survive are assured a definite dielectric factor of safety. The Overpotential Test is one of the many reasons that you do better with Lapp insulators on your lines. May we tell you the whole story? Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp

Better Porcelain • Better Insulators

Tips voltage tested all wood hoods—are safer than rubber

These all wooden insulator and conductor hoods not only take the place of rubber, but provide better insulation protection. They can be safely recommended for use on voltages up to and including 22 KV, which greatly surpasses the maximum recommendations previously established for rubber hoods.

A special tongue and groove arrangement permits the insulator hood to interlock over the end of the conductor hood and prevents these units from coming apart. All joints are made secure by wooden pins and sealed with a special animal glue. Hoods are treated with the same preservative used for hot line tools.

The illustration above shows a lineman using a new fork-like tool for applying the insulator hood from a safe and convenient position. One of these small tools will fit all hoods.

Hoods are made for double or single arm construction having one or two insulators of, not to exceed 9" in diameter.

BULLETINS

data books, etc.

Heat Treating (1015)

A booklet describing four basic heat-treating atmospheres to meet requirements of annealing, brazing, hardening, tempering, gas carburizing, sintering and normalizing has been prepared by Westinghouse Electric & Mfg. Co. The four atmospheres—Endogas, Exogas, Monogas and Ammogas—are said to provide nine variations of gases from which the proper atmosphere for any heat-treating process may be selected.

The 16-page booklet explains the chemical reaction, composition cost, application and equipment needed for each atmosphere. Illustrations include photos of typical furnace applications and schematic arrangement and flow diagrams for endogas generator, exogas generator, carbon dioxide remover for monogas and ammonia dissociator.

Separators (1016)

"'Fine Separation' with Tracyfiers" is the title of a 12-page pamphlet prepared by Blaw-Knox Co. and dealing with its separators for removal of liquid from steam, gas, air or vapor. Construction is diagrammatically illustrated and principles of operation are listed in the booklet.

Hand Tools (1017)

In "Meet the Mechlins," Blackhawk Mfg. Co., tells how its wrenches can be used to exterminate this species of Gremlin. General rules for preserving the life of hand tools are printed on the last page of the pamphlet.

Phenolic Plastic (1018)

Continental-Diamond Fibre Co. has issued a catalogue on its Dilecto, laminated phenolic plastic. Contains data on this material's electrical insulating and mechanical properties.

Lightning Booklet (1019)

Information on its new 16 mm. silent motion picture, "Lightning", is contained in an eight-page pamphlet published recently by General Electric Co. This picture explains some of the scientific facts about both natural and laboratory lightning; shows animated traveling-wave action and actual test performance of G-E lightning arresters and expulsion protector tubes; and gives high lights of the company's research work and facts on lightning-protective equipment.

Metal-Clad Switchgear (1020)

General Electric Co. has prepared a new bulletin on metal-clad switchgear. This publication deals with Type MI-9 for service up to 5,000 volts, with breakers having an interrupting rating of 50,000 kva.

Electronic Controls (1021)

Photoswitch Inc. has issued a new four-page bulletin, giving information on its electronic level controls. Operation, typical applications and instructions for determining level control requirements are included in the information.

Insulation Testers (1022)

James G. Biddle Co. is distributing a bulletin on its "Megger" insulation testers. According to the manufacturer, these instruments are of the same design and specifications as the "Meg" and "Super Meg" insulation testers, with the exception of the case, which is molded plastic.

Fire Extinguishers (1023)

A booklet describing its line of portable and built-in carbon dioxide fire extinguishing equipment and smoke detecting systems has been published by the C-O-Two Fire Equipment Co.

Automatic Timers (1024)

R. W. Cramer Co. has prepared a condensed catalogue of its line of automatic timers. Functions of the various types are described and applications are given. Illustrated.

Fabricated Piping (1025)

Flori Pipe Co. has prepared a 64-page booklet on fabricated piping, covering the various ways in which piping can be used and listing present market prices.

Silver Coating (1026)

Rapid Electroplating Process, Inc., is distributing a folder on its silver coating process for electrical parts. Price list included.

ELECTRICAL WEST, 68 Post St., San Francisco, 4, California

Please send me information about following CIRCLED items:

1000	1001	1002	1003	1004	1005	1006	1007	1008	1009
1010	1011	1012	1013	1014	1015	1016	1017	1018	1019
1020	1021	1022	1023	1024	1025	1026			

Name..... Company*..... Title*.....

Address.....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

KEEPING THOSE POWER LINES "Hot" HELPS OUR FIGHTERS

An uninterrupted flow of electricity to the farm and manufacturing fronts means more food, more supplies for our fighting fronts. So keep those power lines on the job. They'll help compensate for the labor that's been lost.

You can obtain materials and supplies needed for proper maintenance and emergency repair of your A.C.S.R. lines. Alcoa has been authorized to carry an adequate inventory of these materials in stock, so we can make prompt shipment on orders bearing proper authorization. The form of certification required is provided in the WPB Utilities Order U-1.

A.C.S.R. power lines—Aluminum Cable Steel Reinforced—are playing an important part in our country's war effort. These conductors are on many of the steel tower, high voltage lines you see stretching across country. They form vast rural networks. A.C.S.R. provides the high conductivity, high strength and resistance to corrosion that makes the enviable performance of these lines possible.

If you need help in placing repair orders, or on any other maintenance problems, write ALUMINUM COMPANY OF AMERICA, 2132 Gulf Building, Pittsburgh, Pennsylvania.

IMAGINEERING AT WORK

ALCOA A·C·S·R

ALUMINUM CABLE STEEL REINFORCED

This
NEWSPAPER
advertisement was published in Washington, New York and Chicago by McGraw-Hill, to make friends for business.

Have you ever been out of a job?

What you can do

The best way to insure good jobs and better living is to create an environment favorable to continuous industrial progress.

The best way to insure healthy industrial progress is through a nation-wide understanding of the fact that we live better through doing more work in less time.

Nation-wide understanding of that fact will result in laws that encourage industrial progress.

Nation-wide understanding always will be a will-o-the-wisp, unless each business man does his share of: (1) Understanding his own responsibilities in maintaining industrial progress; (2) Explaining the relation between *good* business and good living to his employees and neighbors.

The newspaper advertisement reprinted here is McGraw-Hill's share in the job of explaining the source of good living. It has appeared in Washington, New York and Chicago, as well as in all McGraw-Hill publications. It is available, for use over your own company signature, in your plant city. A mat, six-column size for newspaper reproduction, will be sent to you upon request. Booklet reprints are also supplied at cost ($10.00 per thousand).

James H. McGraw, Jr.
President

McGraw-Hill Publishing Company, Inc.

IF you have ever been out of a job, and if you had a wife, children and slender resources at the time, then the fattest paycheck will never quite obscure the memory of the days and nights you lived with fear.

Some of that fear lingers in every man's mind, for all have suffered in some degree.

► That's why you hear the words "postwar planning" so often. Americans are determined that, one way or another, they are going to keep our thousands of factories going after the war, so that there will never again be a vast army of unemployed.

As usual, in a democracy, there are two entirely different ideas as to how to make 56 million jobs grow after the war, where only 46 million existed before.

Both kinds of people, who hold these different ideas, sincerely want to make the postwar world a better place for you to live in. They have complicated arguments, backed by lots of figures.

But when you trim all the arguments and figures down, you find that one side believes in DIVIDING jobs to make them go round, and the other side believes in MULTIPLYING jobs so there will be greater opportunity for all.

We believe in the MULTIPLYING plan for making postwar jobs and ask you to believe in it too.

Look back over our history. What made us great? Was it rich soil? Africa's is as rich. Was it

[FREE MATS: If you would like to publish this message over your own company name, or distribute it in handy booklet form, write or wire: Research Dept., McGraw-Hill Publishing Co., Inc., 330 West 42nd St., New York (18) N.Y.]

Have you ever been out of a job? (cont'd)

natural resources? China has them in abundance.

NO, the greatness and the good living of America is the direct product of her genius for doing more work in less time.

Invention is the source of improvement, and *improvement* is the multiplier of jobs . . . when products are improved in service or style, or lowered in price, new customers are attracted and new jobs created.

That's why it is true that good living has its source in industrial progress.

When industrial progress is interrupted, we have a depression, and there is less good living.

When (through courageous investment in new and better products) industrial progress is resumed, we go on to even higher levels of good living.

► If every able-bodied person in America is to have a job, then we must all understand the things that make good living possible, and we must all help *improve* the methods that have given so much good living to so many people already.

For businessmen, that means a constant search for improved methods and machines, a regular year-after-year investment in industrial progress. This means avoidance of such things as speculation in inventories that tend to create booms and depressions rather than consistent progress.

For every citizen, it means a constant search for the best ways and means to prevent and cure depressions.

Businessmen, alone, cannot prevent bad times. It's a job for *every* citizen. Every American can help just by knowing that good living comes from doing more work in less time. If you, and all other Americans, swing on to that fact, the laws that control our rate of industrial progress will be better designed to keep the improvement engine running.

That's where government really can be helpful in postwar planning.

It can encourage the "take a chance" spirit that is the basis of all progress. And it can improve the measures which prevent and cure depression. At present, our laws are not framed to encourage investment in new and better methods.

Many local, state and national taxes work out in favor of keeping an old machine, instead of buying a new one.

► There are tens of thousands of machines in the country that are over 20 years old. Even our shiny new war equipment is living 3 years in one, and will be old when the war is over.

Every machine should be regarded as obsolete as soon as it is installed and work started on a better one. In the long run, that is the best way to multiply jobs and create better living. Our laws should *encourage* the process, not *discourage* it.

New machines can only be bought with the profits created by old machines. The money that is laid aside by industry to develop and buy new machines is called "Seed Money." If laws take away too much of the Seed Money of business, that will prove disastrous. High taxes must be paid, but they should not destroy Seed Money, which is the only source of improvement.

That's why it's so important for everyone, no matter what his walk in life, to know this fundamental fact:

"Industrial Progress
is the Source of all Good Living."

THE McGRAW-HILL NETWORK
OF INDUSTRIAL COMMUNICATION

24 publications, which gather "war-news" from the "war-production-front" through a staff of more than 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

This advertisement is available in handy booklet form. (Less than 100 copies free. Larger quantities, $1.00 per 100; $10.00 per 1000.)

McGRAW-HILL

PUBLISHING COMPANY, INC. . . . BOOK COMPANY, INC.

330 WEST 42ND STREET, NEW YORK (18), N. Y.

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Business Publishers International Corporation, an affiliate, publishers of Business and Technical Magazines for Latin America, and Overseas Circulation

ELECTRA'S HUSBAND

Fine Art of Bossing

IF there is any one thing that can be called a fine art in business it is that of being a good boss. This profound thought came to mind as I walked up the street to the house after the evening's mauling in the street car had impressed the cussedness of humanity upon me, I mean actually and physically, at far too close range. The new street car crew was untrained and flustered. Both motorman and conductoress lost their heads and bawled out the customers. The company will get the blame, of course, not the individuals.

This led to thinking of the crying need for training, of teaching the importance of goodwill and persuasive manners in place of dictatorial commands. The conductoress was boss of the street car, but had made her whole load resentful and noncooperative from the first jerk of the bell cord. Her own bosses were too far away and too busy to have taught her better, supervised her to see that she didn't insult the customers. "There'll come a day—"

Such reflection led to the entire problem of supervision of people, from the straw boss on up—especially the straw boss, come to think of it. A friend who has done a good deal in labor relations had told me that almost 90% of the strikes, labor troubles, beefs, slowdowns and gripes could be traced down to some pitifully petty little personal affront given to workers by the foreman, straw boss or department head just one step up the ladder from them.

These irritations, my friend said, accumulated and fermented. You couldn't call a strike because Joe McGee, the foreman, was a cocky, bossy so and so. But such irritations found some sort of high faluting "cause" or "principle" to use as a vent for their built-up emotional charge. Strikes seldom were caused by what the union claimed were the reasons. More times than not they were a wallop at the management in general, taken as a mob, because the individuals with the gripe couldn't take a personal wallop at their incompetent foreman.

True, these days more attention is being paid to training people to be bosses and subbosses. In all companies that are aware of this human situation, work is being done on it. Even that is pretty late. A certain amount of setting has taken place in bosses in the older age groups. They are like concrete and do not learn.

Two processes of adjustment should really be started in grade schools. One is to train each child how to get along with his fellows. The other is how to supervise a group of his fellows and obtain their cooperation. It can't start too soon, for there is no telling when a person will begin to need either or both.

Got to thinking what makes a good boss, anyway. Decided it calls for just about the same specifications as for what it takes to make a good parent. The number either of bosses or parents who have developed this fine art is about the same, and it isn't enough.

A good boss—or parent—is neither too soft nor too hard, but firm. You know where you stand with him. He has to fight his own favoritism and prejudices and be as impartial as he can make himself in judging his people. What is tough on him is that he must set a good example.

He will beget more loyalty if he shows an interest in his men and women or children. His interest and considered praise for merited accomplishment is better coin than money, sometimes, as reward to his workers. But he mustn't forget the pay raise either. If he doesn't like to be asked for it, he should not make it necessary that it be asked for if merited.

The green boss is too free with his show of authority, the experienced boss never has to play that card. The poor boss can't take anything but yessing from his subordinates. The expert boss learns, somehow, because it is the hardest thing a man ever has to learn, how to get criticism from his crew to keep him from stumbling over his own feet.

The real art comes when a boss is able by his fairness, his understanding and approachability, to satisfy for his men their occasional need for a "bargaining representative." If a man needs a lawyer to argue for him then there must be some failure of the boss or bosses to represent that man to his satisfaction to the company. He has to represent company to his crew and crew to his company. Beside all the other things he must do, technically, that is tight rope walking and it is an art.

Being a boss, I decided, isn't easy. The responsibility it carries more than makes it worth the extra money it pays. Being a good boss means accepting its responsibilities as well as its pay. Books could be written on all that the art of bossing requires in self-discipline and training. Probably there are such books. Somehow, I thought, it can't be found only in books, though. It takes a lot of study of people, of learning from mistakes, of living with the art, of practicing at it.

When I exploded all this thinking on Electra that night at supper, she said sweetly, "That's the way you boss this house, dear, always so understanding and fair and provident." At the time I was flattered, I admit, at this, I hoped, deserved comment. But then I began to wonder later on just who was boss around our house, and I wouldn't admit it to her, but if anyone has the fine art of something or other, it is Electra.

WHO knows what a man or an industry can do if really given a chance? The war has certainly proved this basic force in human nature. Challenge it to do the impossible and it will do it. Try to force it and it bogs down. The record in this war is most brilliant where industry was appealed to and not forced. Production schedules are being beaten, inventions flourish, improvements speed the tempo. The railroads have carried far more freight than anyone believed they could. Synthetic rubber production is ahead of predictions because the enterprise of capable companies has been free to rush it along. One of the surprises in the art of bossing is to give a man a job bigger than you believe he can do. Your faith, expressed in such an assignment, helps him to outdo even himself.

HOW much is a billion dollars? An editorial in the *Power Specialist* has it broken down into something anyone can understand. If a company started in the year 1 with a billion dollars and lost money at the rate of $1,000 a day, it would still have 796 years before it would go broke. That is a thousand dollars a day for 2,737 years and 311 days. Only one billion dollars! Small change these days.

OVER 60 UTILITIES

are using the PM plan to spearhead service campaigns

Introduced a short time ago, Anaconda's Preventive Maintenance Plan is being widely used by utilities to help customers keep electrical systems operating *efficiently*—despite shortages in essential wiring equipment.

Already some 60 utilities are actively engaged in this program. With it, they are helping their industrial power customers maintain continuous wartime production by preventing electrical breakdowns.

1 WHAT THE PLAN IS

The PM plan is a simple but comprehensive way to safeguard war production by preventing electrical breakdowns *before they develop.*

2 HOW IT WORKS

The plan provides a practical means of making periodic, systematic analysis of circuits and equipment. Uncovers potential weaknesses . . . suggests ways to correct them . . . prevents overloading of lines.

Data thus gathered aids local W.P.B. Branches in reaching decisions on requests for materials to *prevent* breakdowns.

3 HOW UTILITIES BENEFIT

The PM plan helps utilities maintain close customer contact despite a lack of "something to sell." Offers basis for service campaign that definitely appeals to customers. Puts the utility in a leadership role for furthering war production throughout the area it serves.

If you aren't already utilizing the Anaconda Preventive Maintenance Plan, mail the coupon for full details. 49233

"Tomorrow may be too late . . . do it today!"

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

ANACONDA

Anaconda Wire & Cable Company
25 Broadway, New York City 4

Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding wartime production.

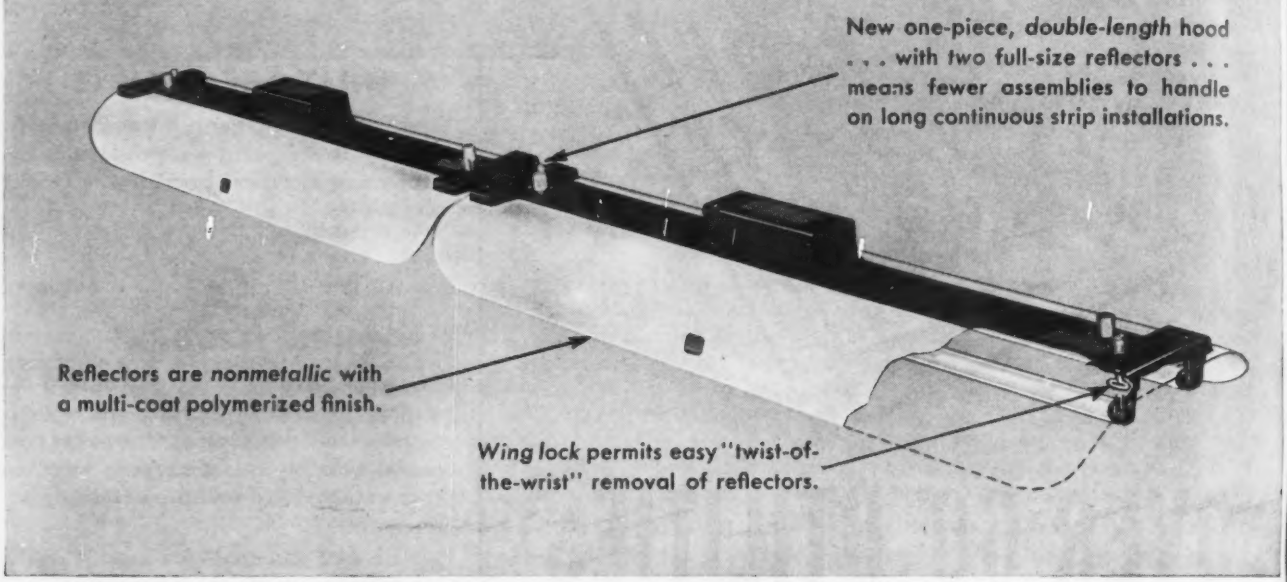
Individual .....

Company .....

Address ..... City .....

10K

BUILT For Easier CONTINUOUS STRIP Installation


New one-piece, *double-length* hood . . . with *two* full-size reflectors . . . means fewer assemblies to handle on long continuous strip installations.
Reflectors are *nonmetallic* with a multi-coat polymerized finish.
Wing lock permits easy "twist-of-the-wrist" removal of reflectors.

A New *LIGHT-WEIGHT* Luminaire For War Production Illumination

Westinghouse Continuous Strip Fluorescent Lighting can now be installed *quickly,* and *economically,* to help speed production of vital war materials. With this new Double-Reflector Luminaire, the only one of its kind on the market today, installation costs are considerably reduced—because you have fewer assemblies to handle.

This luminaire comes to you completely assembled, and is the equivalent of *two* conventional Fluorescent Units. The hood (or chassis) is of one-piece, all steel construction. While conforming with General Limitation Order L-78, it is rigidly built—capable of supporting a weight of 125 pounds at any point. New sliding hangers permit suspension from any part of the hood.

The moisture-resistant, nonmetallic reflectors are covered with a multi-coat, polymerized finish which provides a reflection factor of 85% or more. And it requires only a "twist of the wrist" to remove a reflector for cleaning. The ballast, now externally mounted, provides a power factor ranging from 92 to 99%.

Westinghouse Double-Reflector Continuous Strip Luminaires are available for use with four or six 40-watt (or four 100-watt) Mazda F Lamps. Any one of 117 Westinghouse Electric Supply Company Offices or Independent Westinghouse Lighting Distributors will give you full details regarding these luminaires and their installation. Or you can write Westinghouse Electric & Mfg. Company, Edgewater Park, Cleveland, Ohio.

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE
Lighting Equipment

ELECTRICAL WEST

OCTOBER, 1943
VOL. 91, NO. 4

A Wartime Personnel Training Program

Supervisory responsibilities are stressed in Puget Power training conferences. Improved methods and less accidents inure to benefit of power company

G. L. Rideout

Asst. to Personnel Officer
Puget Sound Power & Light Co., Seattle

WITH the mobilization of the National Guard in 1940 calling to the colors a considerable number of employees, and with America apparently being drawn closer to a state of war, the management of Puget Sound Power & Light Co. realized that the company would be faced with a greatly accelerated turnover in personnel. From studies made immediately following Pearl Harbor, it was estimated that during the year 1942 the company could expect to lose in the neighborhood of 50% of its personnel. This would mean that more than 1,000 new employees would have to be hired. For the most part these employees would be inexperienced in the electric utility business, thereby making it necessary to overhaul completely the company's training program. It was necessary to build in the shortest time possible a sound plan for replacing experienced employees lost to the war effort.

Early in March 1942, 13 supervisors, carefully chosen for their ability to instruct workers, were called into headquarters to attend a one-week institute, conducted by the Training Within Industry division of the War Manpower Commission, for the purpose of becoming certified job instructor trainers. All 13 of these supervisors successfully completed their institute work and received certificates entitling them to hold job instructor training sessions throughout this area.

Every supervisor, in addition to having a complete knowledge of the work he supervises and the knowledge of his responsibilities regarding policies, agreements, rules, regulations, safety schedules, departmental relationships, etc., needs three definite skills—in instructing workers, in improving methods and in leading people.

First is the skill in instructing workers—shortening training time by breaking down jobs into simple operations, making the learner receptive, presenting the instruction, trying out his performance and following up for results. Supervisors receive a practical start in developing skill in instructing workers through the job instructor training program. This training program consists of five two-hour conference sessions under the leadership of a certified job instructor trainer. The program is a practical plan to help supervisors train new employees to perform their duties accurately, quickly and conscientiously. It is built around the application of four fundamental steps in instruction:

1. *Prepare the Worker*

a. Put him at ease.

b. Find out what he already knows about the job.

c. Get him interested in learning the job.

d. Place him in the correct operating position.

2. *Present the Operation*

a. Tell, show, illustrate, and question carefully and patiently.

b. Stress the *key points.*

c. Instruct clearly and completely, taking up one point at a time—but no more than he can master.

3. *Try Out Performance*

a. Test him by having him perform the job.

b. Have him tell and show you; have him explain the *key points.*

c. Ask questions and correct errors.

d. Continue until you know he knows.

4. *Follow Up*

a. Put him on his own. Designate to whom he goes for help.

b. Check frequently. Encourage questions. Get him to look for *key points* as he progresses. Taper off extra coaching and close follow-up.

During the five two-hour sessions of job instructor training, supervisors discuss fully their responsibility for training new employees. They are instructed in job analysis for training purposes and self-analysis in regard to the method they are using in breaking in new employees. This basic truth, "If the worker hasn't learned, the instructor hasn't taught," is the keynote throughout the training conferences held by the company.

By Dec. 31, 1942, Puget Sound Power & Light Co. had 524 certified job instructors comprising members of top management, division managers, department heads, supervisors, foremen and experienced supervised employees, a part of whose work would be the breaking in of new employees. Results of this program can be briefly summarized as follows: 1. During 1942 well over 1,000 new employees have been trained in all departments of the company. 2. The job instructor training program has been responsible for the saving of considerable time in training these employees. 3. Job instructors report that the new people are doing more accurate work as a result of receiving well-planned and organized instruction.

Job Methods Training

With the problem of training new employees on the job being well taken care of, the company next turned its thoughts toward the second skill required of all supervisors, namely, skill in improving methods. This required the ability to improve job methods by studying each operation in order to eliminate, rearrange and simplify de-

tails affecting the use of materials, machines and manpower.

Due to the ever-increasing difficulty of obtaining skilled workers, it is necessary to do everything possible to simplify procedures, processes, forms and operations. With these objectives in mind, the company adopted early in 1943 the job methods training program sponsored by the Training Within Industry division. Once again carefully selected supervisors were brought into Seattle from each division of the company to attend a one-week institute in job methods training. These supervisors were authorized by the War Manpower Commission to conduct conferences in job methods training throughout the areas served by the company.

The job methods training program consists of five two-hour sessions and is based on four fundamental steps:

1. *Break Down the Job*
   a. List all details of the job exactly as done by the present method.
2. *Question Every Detail*—use these types of questions:
   a. *Why* is it necessary?
   b. *What* is its purpose?
   c. *Where* should it be done?
   d. *When* should it be done?
   e. *Who* is best qualified to do it?
   f. *How* is the "best way" to do it?
3. *Develop the New Method*
   a. *Eliminate* unnecessary details.
   b. *Combine* details when practical.
   c. *Rearrange* for better sequence.
   d. *Simplify* all necessary details.
   e. *Work out* your idea with others.
   f. *Write up* your proposed new method.
4. *Apply the New Method*
   a. *Sell* your proposal to the boss.
   b. *Sell* the new method to the operators.
   c. *Get* final approval of all concerned on *safety, quality, quantity, cost.*
   d. *Put* the new method to work. Use it until a *better* way is developed.
   e. *Give* credit where credit is due.

By listing all the details of the present method and questioning every detail, the supervisor receives information which aids him in developing a better, safer and easier method of doing the particular work.

Although this job methods program is only about 50% complete throughout the company, many excellent improvements have been turned in by supervisors and have been put into effect with savings in manpower, machine usage and materials. Puget Sound Power & Light Co. was the first industry in the Northwest to adopt this program and the consensus of the supervisors throughout the company is that this is one of the finest training programs ever conducted in the organization. In addition to its practical value in streamlining and improving operational methods, these conferences have a real tangible morale building effect that should not be overlooked by management.

Accident Prevention Training

One of the greatest causes of absenteeism in industry today is on- and off-the-job accidents. With a nation at war, huge demands for increased production are made of industry. Many thousands must be trained in new skills. The demands for fighting equipment must be met with the least possible amount of delay. This results in a hurry-up training procedure. Both men and women are trained in the bare essentials necessary to get into production, and the accident frequency rate begins to climb.

Puget Power supervisors learn how to instruct new workers. Similar conferences were attended by all executives

Knowing full well that unless something is done to level off the frequency rate curve the time is bound to come when the severity rate would be affected, the Puget Power has designed a training course in accident prevention. With the experience and knowledge gained in job instructor training and job methods training, it decided to attack the problem of reducing accidents from a training standpoint. A definite technique was laid out which can be used by foremen in the carrying out of their everyday construction, maintenance and repair jobs. Foremen, assistant superintendents and superintendents were called upon to submit their ideas for the reduction of accidents. As a result of the merging of these ideas there was developed a practical plan to help foremen reduce absenteeism by the elimination of accidents to workmen through the application of safer methods of working.

Foremen are instructed in the use of this plan through the medium of five two-hour conference sessions conducted by an experienced conference leader. The plan itself is based on four fundamental steps and the method of instruction followed by the two preceding training programs is employed. Foremen are urged to follow these four steps on every job assigned them. The four steps consist of the following common sense, logical and practical means of analyzing and laying out the job as safely as possible:

1. *Check Tools and Equipment*
   a. Be sure that inspection includes both company-owned tools and equipment and that owned by employees.
2. *Lay Out the Job*
   a. Remember that employees cannot work safely if they are working without a definite plan.
   b. Be sure layout includes necessary tools, working equipment and *safety equipment.*
3. *Question the Layout*—use these types of questions:
   a. *What* are the hazards?
   b. *What* safety precautions should be taken?
   c. *What* standard practice should be followed?
   d. *Who* is best qualified to do the job, as to skill—mental attitude—safety record?
   e. *How* is the safest way to do the job?
4. *Follow Through*
   a. Issue clear instructions and be sure that they are followed.
   b. Fix responsibility for safe working.
   c. Supervise closely—watch for hazards—unsafe practices—negligence.

Each foreman attending these conferences is requested to put on a demonstration job, not a fictitious one.

Working from a regular company work sketch, he applies the Accident Prevention Plan to the particular job. Following each of these demonstrations, the group discusses the application of the plan step by step and offers constructive suggestions to the demonstrator regarding the layout, questioning and supervision of the demonstration job.

To the best of the company's knowledge, this is the first time that a definite technique has been developed to assist foremen in carrying their responsibility for safety. The accident prevention training program is now under way and Puget Power will be watching its frequency rate curve very closely during the next year. It is felt that this plan will materially assist supervisors in analyzing their jobs from a safety standpoint. It will teach them to take all precautions necessary to eliminate hazards and insure safer working by the members of their crews, thus reducing accidents to the irreducible minimum.

Foremen who have attended these sessions have been thoroughly interested and have endorsed the plan as being in every way practical and logical. They have assured us that it will materially help them to carry their responsibility for safety.

Leadership Developed

The third skill needed by supervisors is the skill in leading people—increasing efficiency by helping supervisors improve their understanding of individuals, their ability to size up situations, and their ways of working with people. To aid supervisors in acquiring this third important skill, Puget Power expects to adopt, this fall, the job relations training program offered by the Training Within Industry division of the War Manpower Commission.

All of these training programs utilize the conference method of instruction. Each member of the group contributes to building of the program through discussion. He therefore feels that it is his program rather than something being pumped into him and wished on him by management.

To date the company has found that this type of training is enthusiastically accepted by employees and accomplishes far greater results than the more formal lecture type of training used in the past. Obviously, this whole training program has proved invaluable not alone from the standpoint of training new employees, but in greater efficiency, and improved morale of the organization as a whole. Needless to say, the company feels well repaid for the time and effort put into the work.

Suggestions—Instruments of Progress

IT is generally recognized that to achieve progress we must first make the best use of the things that we know and, second, develop new ideas. Suggestion systems reach both of these objectives and are, therefore, instruments of progress. An employee suggestion plan has been in operation on the system of the Pacific Gas and Electric Co. for the past 19 years. During this period more than 3,600 suggestions have been received. Aside from the value of these suggestions in themselves to the company, perhaps of even greater benefit has been the increased interest, improved morale and added pride in their work on the part of the employees.

Suggestions are sent either direct or through district committees to a research committee in the company's San Francisco headquarters office. This committee is composed of management officers and department heads and at present is under the able chairmanship of W. G. Vincent, vice-president and executive engineer. Other members of the committee are: W. G. B. Euler, chief engineer; R. E. Fisher, vice-president in charge of public relations and sales; R. S. Fuller, engineer of gas operation; F. R. George, engineer of electrical operation; D. G. Martin, general auditor and S. B. Shaw, automotive engineer and secretary to the committee. Lee W. Brillhart serves as assistant secretary and handles most of the detail.

All suggestions are promptly handled by the research committee secretary. If a suggestion is deemed meritorious by the committee, a minimum monetary award is made and the suggestor becomes eligible to compete for appropriate cash awards at the end of the year.

Last year there were 432 suggestions received. In addition to three prize-winning awards, the committee made fourteen special awards with monetary considerations ranging from $100 for first prize to $10, for some of the special awards.

The 1943 suggestion contest is now under way. A new and valuable plan of the research committee has been the appointment of division suggestion committees over the system.

With a company the size of PG and E, with its electric and gas operations throughout a vast area in northern California and its street railway and motor coach operations in Sacramento, this reaching out into the various divisions to establish more intimate contact with the employee will make the plan operate more smoothly and of even greater value than in the past.

The field of suggestions is as broad as the scope of the company's varied activities. Possible subjects include:

Construction methods
Operating routines
Plant and equipment design
Service practices
Public relations
Automotive equipment
Printed forms
Safety devices and practices
Tool design
Sales plans
Accounting methods
Office operations
Simplification of procedure
Plant and maintenance operations

Need for repairs may not be made the subject for a suggestion. Moreover, executive, management, design and research personnel, whose responsibility is in part the development of new or improved methods and equipment, are not eligible to participate in the plan.

Research committees and suggestion contests have been widely and successfully used by industry for many years, and to some extent in the public utility field as well. Perhaps, however, many utilities have failed of maximum benefits that might accrue to company and employee operation of such a plan through failure to see its full possibilities or lack of proper administrative organization.

Suggestion plans provide a definite educational program for employees by encouraging systematic and constructive thinking. They provide the opportunity to express these thoughts in a tangible form. Some of the general objectives of suggestion systems are:

1. To provide a definite channel through which employees may submit their ideas and have them impartially considered without fear of criticism.

2. To stimulate a greater interest in the employee's work and, therefore, in the organization that provides it.

3. To minimize grievances and to improve employee-employer relations.

4. To produce a smooth functioning organization, using equipment and facilities in the most efficient manner possible.

5. To develop an increased respect of the individual among his fellow workers and superiors and to improve his own self-esteem.

Both management and employees of the PG and E feel well repaid for the efforts they have put forth in perfecting operation of the plan.

S. B. N. Svendsen, superintendent and Edouard Thys, who started from scrap

Private *Enterprise?* — and How!

No contracts without a plant. No plant without priorities. No priorities without contracts, but a plant was built from scrap to produce for war

R. O. McGougan

Pacific Gas and Electric Co.
San Francisco

NOT a chance of a priority—yet a steel foundry to build and equip.

This problem recently confronted the Sacramento, Calif., firm of Thys and Miller—a partnership consisting of Edouard Thys, an electrical engineer who came to California from Belgium in 1928, and Albert K. Miller, for many years an investment banker in San Francisco.

These men were eager to go into the production of essential war materials —to be specific, the production of a wide variety of steel castings, which leaders in the war effort admitted were urgently needed. But when their project was in the stage of preliminary planning they ran smack into "one of those things." They couldn't get priorities to build a foundry because they didn't have any war contracts for castings and they couldn't get war contracts for castings because they didn't have a foundry.

Nevertheless Thys and Miller now have an electric steel foundry—a remarkably efficient foundry that operates steadily without mechanical failures or breakdowns and turns out great quantities of vital castings for the Army, Navy and Maritime Commission.

No, they didn't get priorities through a change of heart by the powers that be. And, of course, they didn't have an Aladdin's Lamp to grant all their wishes. They adopted the slogan *If we can't buy it, we'll make it* and created a good-sized foundry without priorities. They completely outfitted the plant with equipment resurrected from scrap piles. Altogether they used more than 100 tons of scrap, which they gathered from communities in California, Arizona and Idaho. In their search for discarded machinery and junk they were aided by several employees of the Pacific Gas and Electric Co., the utility that supplies the establishment with electricity and gas.

With the scrap of three states an industrial miracle was performed by Thys and the firm's superintendent, S. B. N. Svendsen. They skillfully redesigned, rebuilt and reconverted a great assortment of junked machinery and materials into an amazing array of foundry equipment. From junk they manufactured an electric furnace, an electric traveling crane, two machines to clean castings, a mill to recondition sand for re-use in molds, a core oven, an annealing oven and other apparatus.

All of the home-made equipment is thoroughly satisfactory, so satisfactory that Thys declares he wouldn't replace a single unit even if he could get priorities to buy anything on the market. Besides being highly efficient, it's all easy to operate. In fact, Mrs. Thys regularly runs the furnace, the traveling crane and other machines. She took it up as a contribution to the war effort and mastered the details in just a few lessons.

For the background of this unusual story we must go back to the summer of 1928 when Miss Beatrice Horst, daughter of the late E. Clemens Horst of San Francisco, took a trip to Europe. While in Belgium she met Thys and they fell in love. He followed her to San Francisco in November and they were married in December.

Thys entered the Horst hop business in 1929 and for six years filled an important position in the sales department. Then, hankering to return to engineering, he took on the self-suggested assignment of developing a hop picking machine. He spent five years at the task and finally succeeded and, when Horst died in 1940, withdrew from the firm to undertake the manufacture of mechanical hop pickers. It was for this purpose that he and Miller formed their partnership. They established a factory in Sacramento and produced and marketed a considerable number of the machines.

Then came Pearl Harbor—and hop picking machines weren't nearly so im-

Once the shell of the electric furnace had been part of a large water filter. Pipes were removed and firebrick cemented in to make a new lining. Controls, which Mrs. Thys often operates, came from old automobiles and trucks

portant to Thys and Miller. Eager to switch to the production of war essentials, they canvassed military requirements and quickly learned that there was a woeful shortage of all sorts of steel castings. They decided, therefore to put up a foundry and help overcome the critical shortage. However, as soon as they started to put their decision into action they ran into the snag of "no priorities." But they went ahead anyway.

Even Ripley of *Believe It or Not* fame would be amazed by the electric furnace and the infinite variety of its antecedents. In its present status it is five feet high and five feet in diameter, with a shell of half-inch steel lined with silica bricks. Its capacity is 1,000 lb. of steel per hour. It is heated by three 146-volt electrodes, four inches in diameter, that produce arcs of 6,000 degrees Fahrenheit. Power is delivered to the foundry at 2,300 volts and reduced to 146 volts by special furnace transformers.

Yes, this furnace has a unique family tree.

Thys found the shell in a junk yard in North Sacramento and, although he wouldn't bet on its ancestry, he believes it formerly was part of a large water filter. To adapt it for its role in the foundry, he had to remove a network of coiled pipes from the inside, take off its steel top and replace it with a special brick top nine inches thick.

By a stroke of good luck, the electrodes were located in Boise, Idaho. They had been manufactured for a company that had planned to build an electric foundry there but abandoned the project.

The good luck, however, did not include the electrode holders. For a time that stumped both Thys and Svendsen, because electrode holders are made of copper castings—and obtaining copper castings was practically impossible. But they weren't stumped for long. Right in their home town of Sacramento they ran across a lot of copper tubing that once had been used in a brewery and from that tubing they made their own electrode holders.

On a par with the holders is the winch that raises and lowers the electrodes. It was made from various and sundry parts of discarded automobiles.

Other parts of the same old autos were employed to make the mechanism that tilts the furnace to pour out the molten metal.

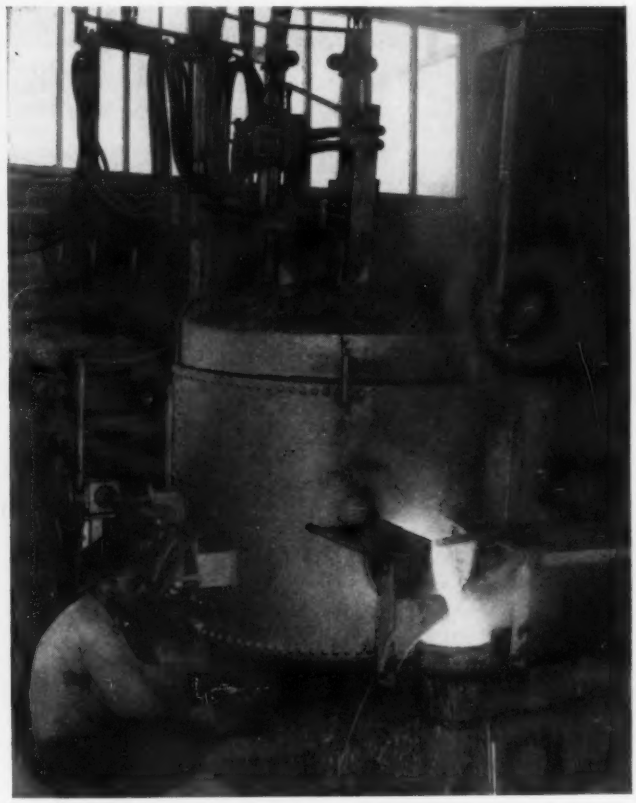
Relatively easy was the task of obtaining the heavy copper cables required to connect the furnace with the electric power lines. They came from several mines and gold dredges in various parts of northern California, which had been shut down because of the war. And guess how they are insulated. With sections of ordinary rubber garden hose!

The furnace transformers came from the plant of the Pacific Coast Steel Corp. at Niles, about 15 miles south of Oakland, where they had been replaced by large units. Incidentally they were among the items tracked down by PG and E men. They were 26 years old, were obsolete in many respects and were designed to reduce voltage from 4,300 to 100 instead of from 2,300 to 146 as needed in the Thys and Miller foundry. However, they were completely overhauled and reconnected to step down voltage as required in their new locale.

PG and E engineers further aided the project by locating certain reactance coils that the utility had purchased for other purposes and that no longer were being used. These coils were absolutely necessary because the obsolete furnace transformers lacked adequate reactance and, as a result, there were violent surges of current that prevented the electrodes from holding their arcs. With the extra reactance coils installed, stabilized arcs could be maintained.

Parts for the traveling crane came from three places, beam and wheels from Arizona, hoist from San Francisco, motors from Sacramento. Mrs. Thys operates it

Electrodes were found in Boise, holders were made from brewery coils, cable came from abandoned mines, insulation was rubber hose. It all was made to work successfully



The electric traveling crane is a combination of scrapped equipment from three areas. The beam and the wheels on which it travels from one part of the foundry to another came from a quarry in Arizona. The hoist was dug up in a second-hand machinery shop in San Francisco. A Sacramento dealer supplied three used motors to complete the job—one of five horsepower to move the beam back and forth, another of one horsepower to move the hoist along the beam and still another of two horsepower to operate the hoist itself.

So it goes with the rest of it.

One of the machines for cleaning castings was manufactured from the differential housing and axle housing of an old tractor. Its mate was made from a piece of three-inch pipe and some castings produced in the foundry after the furnace was finished.

Especially remarkable is the sand reconditioning mill. It was built with the transmission of a hop picking machine, the rear axle of a heavy truck and two wheels from a defunct Southern Pacific locomotive.

Remarkable, too, is the core oven. It was built around worn burners removed from the furnace in the Thys residence. The annealing oven is the product of odds and ends gathered during a housecleaning in the hop machine factory.

All in all the Thys and Miller foundry is an almost unbelievable conglomeration. But it works.

Choose a Heat-Treating Furnace Wisely

R. W. Steenrod
Pacific District Heating Specialist
General Electric Co.

NECESSITIES of wartime conditions have resulted in a steady increase in the use of electricity for the heat treatment of metals required by Western industries. The installation of electric furnace equipment during this period will, no doubt, have a marked effect on future industrial trends, with many new fields made available to manufacturers of postwar products.

More than twenty distinct types of electric furnaces are available, each of which has several variations, so that industry may choose a unit custom made for the application involved rather than attempt to adjust a "hand-me-down" unit. While the array of available electric furnaces may appear formidable, selection of the proper unit becomes simple when all factors are considered.

Copper Brazing

One of the more interesting applications of electric furnaces is the fabrication of steel assemblies through the process of copper brazing. By this process suitably formed low-cost steel stampings are often assembled into a complete unit which, when prepared with a proper amount of copper and conveyed through a brazing furnace, emerges as a completely rigid assembly with surfaces chemically free from oxidation or scale. By use of proper protective atmosphere in the furnace, these surfaces may also be held free from all traces of decarburization, thus permitting subsequent heat treatment without the necessity of removing the decarburized surface metal. Fabrication by the copper brazing process results in low unit cost, consistently uniform high quality of product, mass quantity production and, in most instances, considerable reduction in weight of metal. Assemblies consisting of well over one hundred individual steel stampings have been successfully fabricated by this process, thus indicating the tremendous possibilities to be obtained.

Three Types

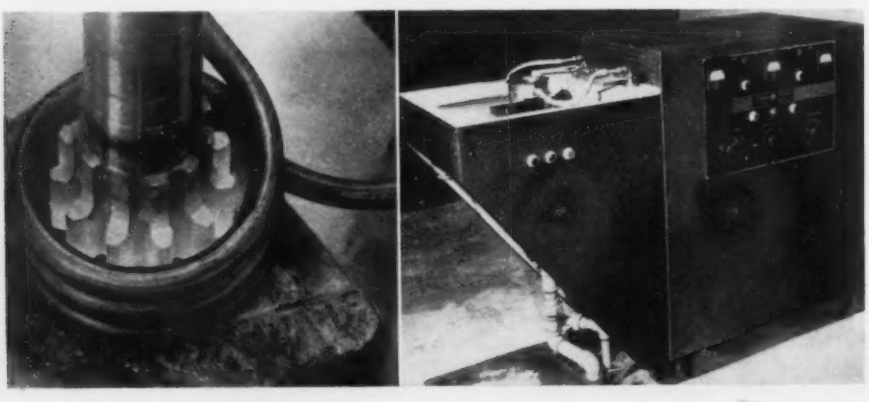
Electric copper brazing furnaces have appeared on the West Coast in three conventional types, depending upon production requirements. The manually operated box type furnace is used for developmental design of production assemblies and for production brazing of relatively light weight assemblies in quantities up to approximately 100 lb. per hour.

The automatically operated continuous mesh-belt type furnace is used for mass production of relatively light weight assemblies in quantities up to approximately 400 lb. per hour.

The continuous roller hearth type copper brazing furnace is used for mass production of either light or heavy assemblies in quantities from 400 to 2,000 lb. per hour. Modifications of the conventional types of furnaces, or special types, will undoubtedly appear, despending upon the changing requirements of the aircraft industry.

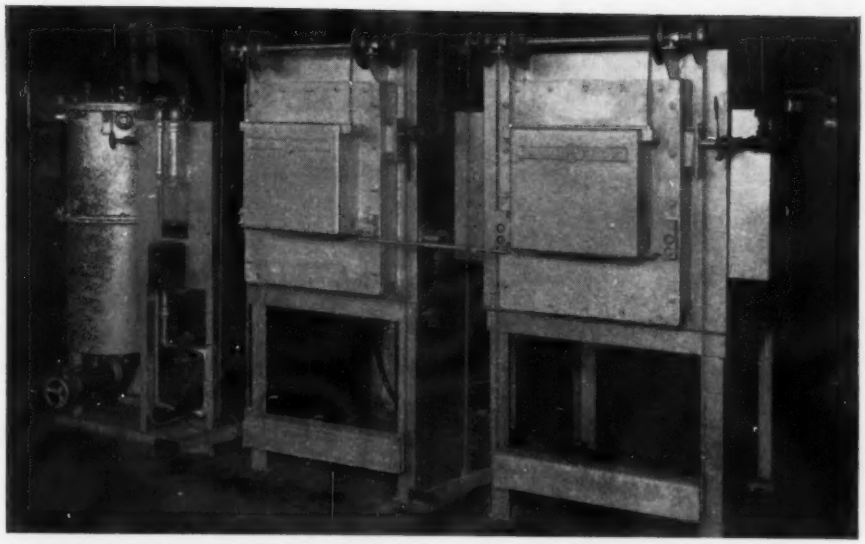
Pit Type

Heat treatment of long, tubular landing gear aircraft parts has introduced a new type of electric furnace to the West Coast. The desirability of oil quenching such parts from a vertical position has suggested the use of vertical-cylindrical pit type furnaces for normalizing and heat treating. The tubular parts are suspended vertically from an alloy fixture which is, in turn, supported by an alloy ring immeditely below the furnace cover. A suitable crane is used to transfer the charge from the furnace to the oil quench. The draw furnace is constructed similarly to the heat-treating furnace to facilitate handling and drawing of the charge subsequent to quenching.



Inductive heating a gear for hardening, using a 15-kw. electronic heater. At right, compact, unit type 5-kw. electronic heater for small parts treatment

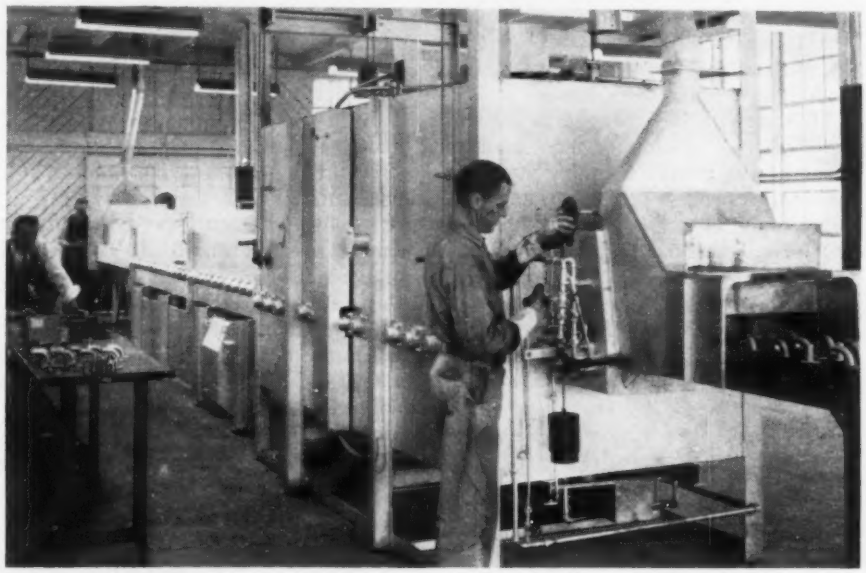
Increased production schedules of manufacturers, combined with war emergency limitations on scarce materials, have introduced many types of high-speed cutting tools. Such tools require exceptionally high quality heat treatment to insure reasonable life at high production rates. Complete freedom from decarburization and accurate control of temperatures are required to produce best results. Heat-treating equipment which has been introduced for this work consists of a protective atmosphere generator for producing non-decarburizing atmosphere, a gas-tight box furnace for preheating up to 2,000° F., a gas-tight high temperature box furnace for final heating up to approximately 2,500° F. maximum and suitable facilities for quenching and final draw.



Typical box type manually operated furnaces with protective atmosphere (Drycolene) producer at left for both. These are 15-kw. and 36-kw. furnaces

Electronic Hardening

The latest type of heat-treating equipment soon to become established in plants of West Coast manufacturers has been made possible by developments in the field of electronics. One of the more important applications is in the surface hardening of gears and pinions. The advantages of electronic heat are many: Gears may be surface hardened to any desired depth without the necessity of carburizing; a high degree of uniformity is obtained through accurate timing; distortion of intricate shapes is reduced to a minimum; heavy gear or pinion shaft sections remain unheated with resulting saving of time of heat treatment; little or no final grinding or machining is required after heat treatment; fully automatic features of the electronic heater permit operation by inexperienced labor, eliminating the necessity of maintaining the services of a radio technician to tune the resonant circuit. The electronic heater is also well adapted for silver brazing and for many special applications which, due to handling difficulties, do not lend themselves economically to other methods.



Above, copper-brazing, roller-hearth, conveyor-type, 91-kw. furnace at Die Cast Corp., Glendale. Below, Menasco Mfg. Co., Burbank, pit type furnaces

Future possibilities of electric heat in West Coast industries will depend upon the installation of local manufacturers of heat-treating equipment which will produce highest quality work at minimum unit cost, reducing competition from experienced eastern manufacturers. Expansions in generating capacity of Western power companies, which have developed through demands of the war effort, will undoubtedly favor the advancement of electric heat in postwar manufacturing and assist in establishing the West as a greater power in American industry.

The Old Tannery Goes Streamline

Leather processing is revolutionized by producton line methods and individual motor drive for every operation. Power distribution has many innovations. Critical materials conserved

THE old tannery has finally gone modern. A fine example of what the industrial engineer, the mechanical engineer and the electrical engineer can do when given an opportunity to apply their talents to streamlining an industrial process is the tannery of Poetsch & Peterson in South San Francisco, where revolutionary methods have been applied to one of the oldest and most backward of industrial processes—that of tanning leather. One of the primary considerations in design and construction was to save critical materials, yet provide production line methods to eliminate lost motion, reduce man-hours and cut former heat and power losses.

First step in designing a new plant for this 60-year-old Western tannery concern was a material flow study of the entire process. This resulted in an entirely new layout for tanneries in which individual motor drive made possible a production or processing line with greatly reduced unit costs.

At the outset the designers determined upon a course of plant construction that would conserve critical war materials. Their aims were:

1. Use of concrete and wood to eliminate steel framework.
2. Use of individual motor drives and gearmotors to eliminate lineshafting, belts and pulleys, and hence reduce power consumption and industrial hazards.
3. Use of circuit breakers instead of switches and fuses to conserve copper and simplify control.
4. Use of 440 volts for power circuits instead of the usual 220 volts, to effect a further saving in copper.

Since all machinery in the plant is motor driven, the matter of controls, type of motors and distribution panels was given serious consideration. It was decided that standardization of electrical equipment was desirable, Westinghouse equipment being selected for use throughout the plant.

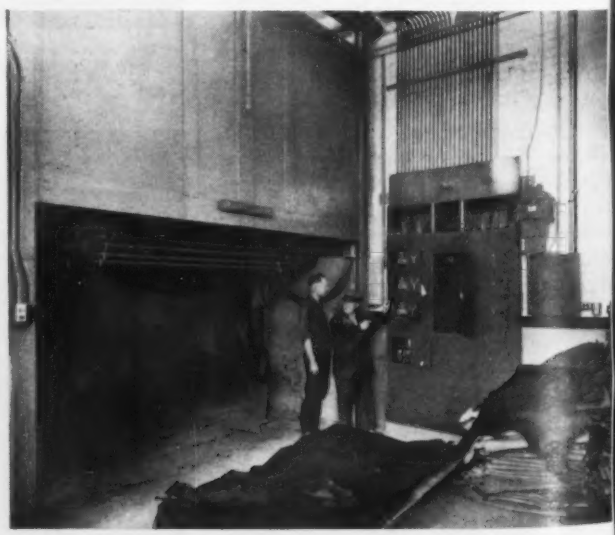
Motors are of the sleeve-bearing, splash-proof, full-voltage starting type, many of which are gearmotors for special drives with ratios varying from 16 to 1 to 2,500 to 1. Special panelboards, some seven in all, contain all the controls and De-ion circuit breakers necessary to handle the plant operations. Machines are equipped with push buttons only, no fuses being used in the plant. Notable is the fact that all large wire runs were placed underground or in brick walls in transite ducts to and from main service panels and to and from distribution panels. Conduit runs from machines to panelboards seldom exceed ¾ in. in size.

Power is supplied by a bank of three 100-kva. transformers, which reduce the voltage from 4,000 to 440 volts for distribution throughout the plant as shown by the accompanying single-line diagram. The main secondary feeder to the plant terminates in a No-fuse, De-ion circuit breaker panelboard. Breaker protected feeders radiate from this board to seven combination AB De-ion circuit breaker panels and control centers.

These control centers are an interesting application of up-to-date electrical facilities. Each is so located that it serves a group of motors. Each motor is fed by an individual circuit with magnetic starter and circuit breaker mounted in the control center panelboard, thus leaving only the motor and push button stations to be mounted at the machine. Removing this equipment from areas where it would be subject to dirt and excessive moisture on the "wet" side, eliminated the need for dust-tight and water-tight enclosures. Moreover, the job of checking, testing and general maintenance is greatly simplified by this compact type of installation.

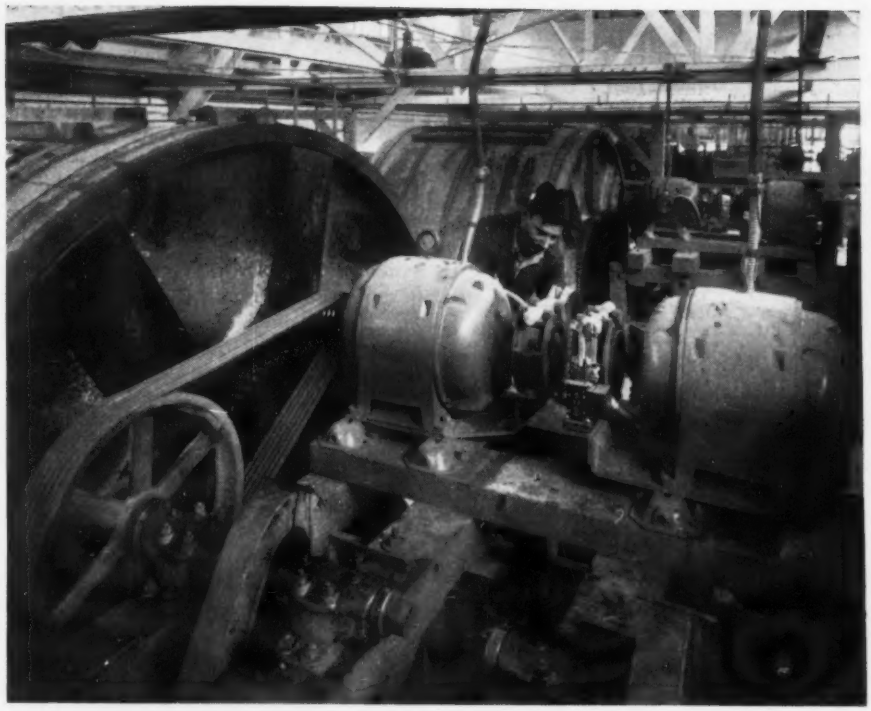
One of the accompanying photo-

Below: Heavy leathers are treated in this special toggling dryer, new to leather processing. Airplane-type propellers circulate 4,000 cfm. of heated air. Workmen are fastening a skin onto the drying frame. It is hinged then into vertical position and passed by monorail into drying chamber



Above is one of seven power panelboards that combine motor starters and circuit breaker protection at a central location, leaving only the push button to be mounted at the motor. Hides have completed their trip through a 70-ft. dryer and are ready to be softened and trimmed

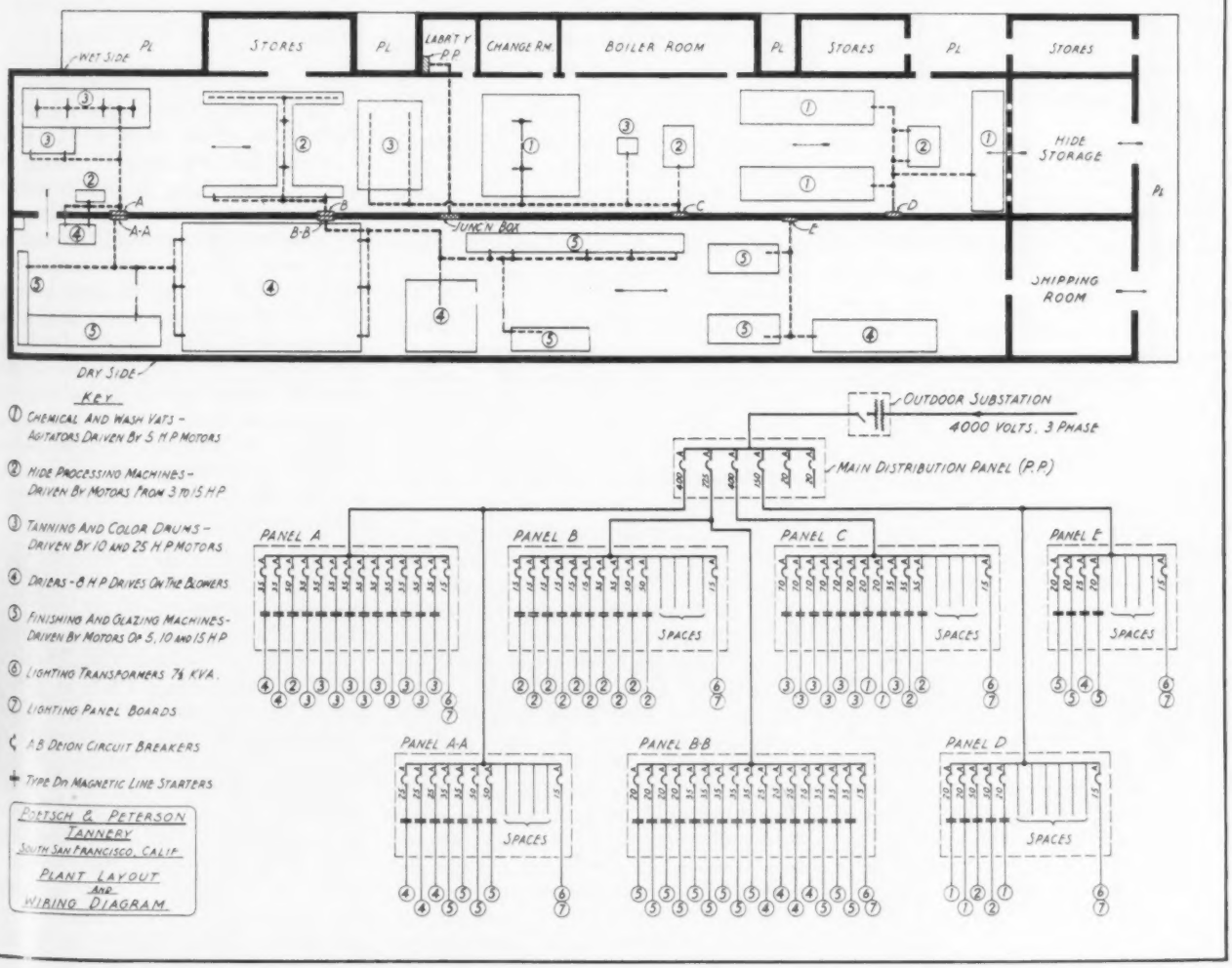
Magnetic brakes, applied for the first time to tanning drums, permit inching drums into exact position for loading and unloading, greatly reducing labor costs. Each of six drums is driven by a 25-hp., full line start motor through V-belt drive. Drum capacity is two tons



graphs shows a typical control center panelboard set into the brick wall which divides the plant down its center. The face of each panel is set out three inches from the wall to allow entrance of conduit runs against the wall. From the main distribution panelboard, branch feeders are run in transite ducts underground to a large junction box in the center wall. From this, the feeders continue on through transite ducts to the combination control centers. For the motors and control circuits, ¾-in. steel conduit was used.

In one of the accompanying photographs a dry-type transformer will be noted hanging on the wall to the right of the large power panelboard. Three such transformers, two 7½ kva., and one 10 kva., serve nine lighting feeders supplying lighting panelboards in various parts of the plant. These transformers step down from 480 volts to 120/240 volts, for three-wire, single-phase lighting, thus permitting both lighting and power to be served

Here is the plant layout and single-line wiring diagram. All feeder wiring is in transite, which saves critical material



through one meter and over the same distributing system up to the point where the transformers are located. Provision has been made for a lighting transformer at each of the seven power panelboards as soon as lighting details have been completely worked out from actual experience with the new plant layout and the new type of machinery installed.

Streamlining Production

The material flow study previously mentioned was used to establish the type of building best suited to this industry. A one-story structure elevated to car and truck loading height was decided upon. This main structure, 125 ft. wide by 450 ft. long, divided longitudinally by a central brick wall, provides the area within which the progressive flow of materials takes place. Raw hides enter the end of the "wet" side of the main structure and pass in sequence, wash, lime, bate, and pickle tanks, enter the tanning drums area, traversing an over-all distance of 450 ft.

Leaving this area the product directionally reverses itself into the other parallel building section, or "dry" side. Here the product passes through wringers, progressive dryers, toggling dryers, buffers, sanders, stakers and finishing tables to measuring, grading and sorting arrangements in the shipping room. The total distance traversed is some 900 ft., the termination being from point of entry immediately adjacent.

To modernize arrangement of the plant it was necessary to provide equipment facilities quite different from that of contemporary tanneries and from that of the one being vacated. The elevated concrete floor with special attention given to the problems of drainage, traps and catchment devices is provided with wearing surfaces of the non-slip type. Specially designed concrete vats with unique traveling agitators are installed. The use of tanning and color drums equipped with a new type, liquid-tight, quickly removable and replacable door is an innovation. The use of magnetic brakes on the drum motors for holding and inching large drums into any desired position is a new development in the tanning business.

Minimizing the use of steam to the production of hot water for hide washing only as its principal function, and the equipping of dryers, stuffing and split-drying drums with indirect heated, gas-air facilities, in lieu of steam heated rooms, is of interest. Dryers of the progressive type with specially designed, slow-motion, traveling hangers probably have not been used before in the leather industry on the Pacific Coast.

The products movement is always slowly forward, never backward, and the pressure of constant new batches added from raw hide storage necessitates clearance of material put into motion the day before. This is chain production applied to the tanning business. This plant, so different from its predecessor as to layout, equipment, electrical facilities and operation, will reflect, no doubt, many advantages inherent to streamlining and modernizing of industry.

Louis Stocklmeir, industrial consultant, and Jay M. Smith, mechanical engineer, both of San Francisco, collaborated in the design of the new plant. Atlas Electric & Engineering Co., San Francisco electrical contractor, made the electrical installation.

Sight for Victory

Results obtained from the *Sight for Victory* campaign conducted throughout northern California by manufacturers, illuminating engineers and salesmen and the Pacific Gas and Electric Co. were summarized by J. H. Gumz, manager, commercial and industrial sales, PG and E, as being very gratifying. "With nearly 400 sight-light checks made and followed by 124 lighting recommendations it is a natural assumption that a big improvement in production will result," he declared.

Up to Aug. 31 the number of personal contacts made totaled 971; number of books delivered, 963; number of sight-light checks made, 396; number of lighting recommendations made, 124. Besides this the General Electric Supply Corp. sent out a series of three letters to each of 2,250 manufacturing establishments, machine shops, etc. In reply to an offer for a book on *Plant Efficiency*, 31 replies were received; to one on *Sight for Victory*, 109 replies; to one on *Fluorescent Maintenance*, 47 replies. Westinghouse Electric Supply Corp. sent out 1,800 letters, made 168 contacts, delivered 151 books, made 151 sight-light checks and more than 14 lighting recommendations.

The illuminating engineers from the divisions of PG and E reported a total of 1,176 manufacturing establishments, in which personal contacts made were 694, number of books delivered, 693; number of sight-light checks made, 245; number of lighting recommendations, 110.

The various divisions did special work. The East Bay division mailed 900 letters and about 40% of the calls in the division were made by contractors working in conjunction with the utility. The San Francisco division mailed 502 letters and contacts were made in company with safety engineers. Other divisions reported success with the program, a fine reception on the part of the industries contacted, many improvements made in existing lighting equipment arrangements and shielding, and a receptive attitude for much relighting business when the war is over.

● A LIGHTING COURSE for employees at Hale Bros. stores in San Francisco and northern California was recently completed by Clark Baker, lighting counselor of the Northern California Electrical Bureau. This department store has had as its ambition establishment of the best department in each city for merchandising Better Light—Better Sight equipment, and wanted to coordinate its furniture departments, rug departments, drapery and other departments in the proper use of light with respect to these commodities. Despite wartime interferences, a total of six classes was held at the Merchandise Mart for employees from five stores. Lack of lighting merchandise has stopped the further development of the educational classwork for the duration.

● INDUSTRIAL LIGHTING advice will be mailed to industrial plants of the Los Angeles Bureau of Power & Light territory in four brochures, the first two of which have been prepared. These will be accompanied by a letter of transmittal. The purpose is to offer the service of the staff of the bureau to make lighting surveys which may aid the war effort by better employment of existing facilities. There will be no sales effort made, the emphasis being on maintenance and use of equipment at hand. The first brochure touches upon factors governing a good lighting installation with a check chart on which the recipient may check whether or not his own lighting provides these conditions. The second treats on maintenance and what to do with existing equipment. Two others are to follow.

● NO MORE REASON to accept crippled eyes as inherent than to accept crippled legs, Prof. J. C. Morgan, mechanical and engineering department, University of British Columbia, told the Vancouver Lions Club in a recent talk. Yet because eyes are abused, asked to work under impossible conditions, subjected to inadequate lighting, glare, heavy strain, they develop defective vision. He said that today one out of four high school graduates, one out of three university graduates and one out of two people in middle age must wear glasses, which largely can be charged to inadequate lighting.

Make Every Horsepower Work Harder Now

Maximum utilization of all available energy calls for loading of motors to full capacity, operating at higher temperatures, using standard models rather than special types where possible

K. R. Collins *

District Engineer
Westinghouse Electric & Manufacturing Co
Los Angeles

WE are no longer a nation so rich in raw materials that we have no concern about adequate supplies for our manufacturing operations. With the rapid spread of this war the control of now critical raw materials passed from our hands to those of the Axis nations. Fig. 1 indicates graphically the sharpness of this reversal.

In spite of this reduction in our raw material control we must supply an ever increasing demand for these materials. To do this we must, (a) eliminate the use of critical materials wherever possible, (b) substitute non-critical materials when possible, (c) obtain the maximum utilization of the critical materials when and where they must be used. It is in maximum utilization that much can be done to conserve materials used in electric motors.

The first step in making a motor application in line with these suggestions and regulations is, of course, to find the facts pertaining to the load and operating conditions. Where possible make actual load tests. If this cannot be done make a careful comparison with the known power requirements of similar equipment. There will be occasions when neither one of these methods can be used and it will be necessary to resort to calculations. Make these calculations accurately and eliminate all excessive safety factors. In peacetime it was common practice to apply oversize motors, "overmotoring" was the term, to be sure there would be sufficient power for all requirements. This practice must be discontinued. Not only does this use an excessive amount of material for the actual load requirements, but the underloaded induction motor with its attendant low power factor places a nonproductive load on plant distribution systems.

Close attention should be paid to the operating conditions. Observe the surrounding air temperature to see if it is above or below the electrical rating ambient of 40° C. Check the duty cycle to determine if it is possible to use an intermittent rated motor instead of a continuous duty motor. If dust, water vapor or other materials in the air are excessive, see if it is possible to control them so that an open motor can be used. When the application is in a hazardous area see if the motor can be relocated outside the area so that an explosion proof motor need not be used.

When all of these facts have been found the selection of the motor can be made on the basis of the new up-ratings. A better understanding of these up-ratings can be had when the reasons for them are known. The ultimate limiting temperature for Class A insulating materials is 105° C. and it is still the expectation that this temperature will not be exceeded after up-rating. This ultimate temperature corresponds to limiting observable temperature of 90° C. by the thermometer method for open motors and 95° C. by the resistance method for enclosed motors.

Critical Materials Resources

Comparison of United Nations' resources to the total — Axis Nations holding the balance.

Before the war	Metal	Now
73%	Steel	50%
94%	Copper	83%
99%	Tin	35%
68%	Aluminum	42%
75%	Pig Iron	44%
95%	Tungsten	65%
44%	Magnesium	32%

On the basis of these limiting temperatures two margins are provided in present-day open motors and one margin for enclosed motors. The margin common to both types is in ambient temperature. Motors are designed on the basis of a 40° C. ambient whereas it has been found that the national average ambient temperature throughout the year is not more than 30° C. Therefore, all motors can have an additional 10° C. rise without exceeding their limiting temperatures in locations where the ambient follows the national average.

Subtracting the average ambient of 30° C. from the limiting observable temperature of 90° C. for open motors and 95° C. for enclosed motors, we arrive at the observable temperature rise of 60° C. for open motors and 65° C. for enclosed motors. Open motors are designed for a 40° C. rise and enclosed motors for a 55° C. rise. This means then that open motors have a margin of 20° C. and enclosed motors 10° C. Of these amounts, 10° C. has been accounted for by the 10° C. lower ambient. There remains an additional 10° C. in design for open motors but nothing additional for enclosed motors over the margin provided by the lower ambient temperature.

Therefore, all open 40° C. rise motors have a total margin of 20° C. and all enclosed 55° rise motors 10° C. On this basis the following ratings can be used where rated voltage is maintained and where the ambient temperature, normally, will be below 40° C. and, will only occasionally and for short periods exceed or equal 40° C. Recommendations are:

(a) For open a-c motors rated 40° C. use a motor rated at 80% of the load requirements.
(b) For a-c or d-c motors rated 50° C. semi-enclosed or 55° C. totally enclosed, use a motor rated at 91% of the load requirements.
(c) For open d-c motors rated 40° C. use a motor rated at 87% of the load requirements. This decrease of 7% for open d-c motors over open a-c motors is due to commutation limits rather than thermal limits.

Fig. 2 shows representative savings in pounds of critical materials for open a-c motors applied under these rules.

The use of 60 cycle motors on 50 cycles has been common practice in southern California. Naturally the question arises for these users as to how this program affects their motor applications. A 60-cycle motor on 50 cycles already has an overload of 20%. Therefore the entire temperature margin for open motors is already consumed and no further up-rating should

* From a talk presented to the Southern California War Production Clinic, Factory Electrical Equipment panel, at University of Southern California, Los Angeles.

be considered. In the case of enclosed motors the overload will be in excess of the gain from lower ambient temperature considerations and the application should not be made even at rated horsepower.

After rerating it is possible that starting torques may be too low on the basis of the new horsepower rating. For example, a 10-hp. induction motor with a 160% starting torque, when rerated to 12.5 hp. will have only 128% starting torque at the new rating. This can be rectified by increasing the supply voltage, where possible. An open motor can have the supply voltage increased 10% without temperature increase because the I^2R losses drop more rapidly than the iron losses increase. Since the starting torque varies as the square of the voltage, a 10% increase in voltage will give a starting torque for this example of 155% ($1.10^2 \times 128$). This can be done only for open motors since an increase of 10% in voltage on an enclosed motor is the same as a 10% overload. If the voltage on an enclosed motor is increased 10% no uprating in horsepower can be made. This occurs because the increased iron losses. which are represented by heat, cannot be dissipated as readily in an enclosed motor as in an open motor.

D-c motors will, in general, have a wide margin of extra starting torque when rerated to utilize the maximum available horsepower and no starting difficulties will occur as a rule under these conditions.

Very seldom will the user have control over the frequency of his supply voltage. However, where it can be made higher it will help to maintain rated speeds after the up-rating of induction motors.

In peacetime fan-cooled or splash-proof motors were used because they were the best life-time motors for the application. Often, in emergencies, standard open motors can be used. This war is just such an emergency and the use of these special motors must be discontinued whenever and wherever possible.

An open motor not only requires less critical materials in its construction, as shown in Fig. 3, but it takes 40% less machine and man-hours, equally critical items now, in its manufacture. There is the further important consideration that an enclosed motor does not utilize the maximum available horsepower from the materials used, since for the same horsepower an enclosed motor does not have the up-rating margin of the open motor as has been already pointed out. Open motors also can usually be applied with sealed sleeve bearings, except where high thrust or vertical operation is present. This is seldom possible for enclosed motors. Again the saving is not alone in critical materials, because the use of sealed sleeve bearings releases more ball bearings for tanks, planes, and other vital war needs.

A large saving in materials can be made by using the highest possible motor speed. High speed motors use far less vital materials as they can be built on smaller frames. More horsepower per pound of material is therefore obtained. In d-c adjustable speed drives use the highest base speed. Avoid the use of multi-speed a-c motors where a single-speed, single-winding motor will do the job. Also, avoid the use of dual voltage motors. These applications may not always be the most desirable or convenient but war is never desirable or convenient.

One very important thing is for industrial users to substitute a-c motors for d-c motors wherever possible. Horsepower for horsepower, an a-c motor uses less copper than a d-c motor. The use of a-c motors will also release d-c motor production capacity for essential military, maritime, and industrial needs where no other motor will do the job required. The elimination of unnecessary applications of d-c motors will relieve this present shortage of d-c motor manufacturing capacity.

Close adherence to the principles outlined here will result in an estimated saving of up to 40% of the copper, steel and aluminum used in motors. This means we can build 40% more motors—40% more horsepower for industrial and war needs, with the same amount of materials. This is the "Maximum Utilization of Available Horsepower."

OPEN TYPE A-C MOTORS, 1,750 RPM

For Maximum HP. Loads of	Use This HP. Motor	Instead of This HP. Motor	And Save This Many Pounds of War Material
1.25	1	1.5	36
1.88	1.5	2	14
2.5	2	3	4
3.75	3	5	19
6.25	5	7.5	63
9.38	7.5	10	80
12.5	10	15	36
18.75	15	20	31
25	20	25	106
31.25	25	30	176
37.5	30	40	186
50	40	50	94
62.5	50	60	320
75	60	75	120
93.75	75	100	110
125	100	125	550

FAN-COOLED TYPE A-C MOTORS 1,750 RPM (Totally Enclosed)

For Max. HP. Loads of	Use This HP. Rating of Open Type A-C Motors	Instead of This HP. Rating of Fan-Cooled A-C Motor	And Save This Many Pounds of War Material
1.25	1	1.5	59
1.88	1.5	2	45
2.5	2	3	35
3.75	3	5	90
6.25	5	7.5	174
9.38	7.5	10	286
12.5	10	15	233
18.75	15	20	273
25	20	25	400
31.25	25	30	581
37.5	30	40	520
50	40	50	474
62.5	50	60	660
75	60	75	465
93.75	75	100	990
125	100	125	1080

● ELECTRIFIED PRODUCTION BY NECA MEMBERS is the title given a 24-page magazine-size brochure which is being made available by the National Electrical Contractors Assn. to its members for the promotion of their business. Particular emphasis is placed in this brochure on the ability of the electrical contractor to handle efficiently and expeditiously the maintenance work of a war production plant. It shows by text and illustrations that the contractor has to offer management, men and materials which make the electrical contractor's work in reconversion, construction or maintenance work more efficient and less costly in the long run than a permanently retained maintenance staff.

● STOCKS OF CONDUIT seem to be ample in all Western warehouses of suppliers and manufacturers, yet the arbitrary restrictions on the use of conduit has frozen this material away even from industrial jobs where it is required by local ordinances for protection of various circuiting. As the construction program tapers off, these large stocks of metal are virtually immobilized and rendered of no assistance to the war effort because of inflexible restrictions. In many instances considerable difficulty was involved in changing circuits to open wiring, building elaborate protection of not too fire resistive materials and other expedients to do without conduit.

Copper Gets in its Pores

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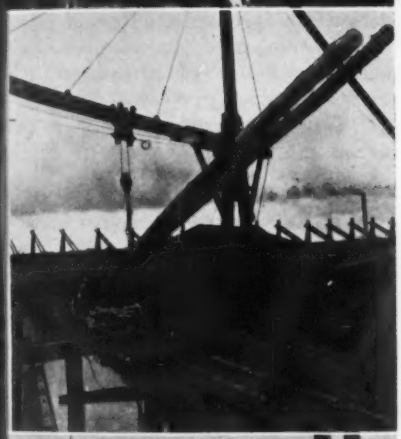

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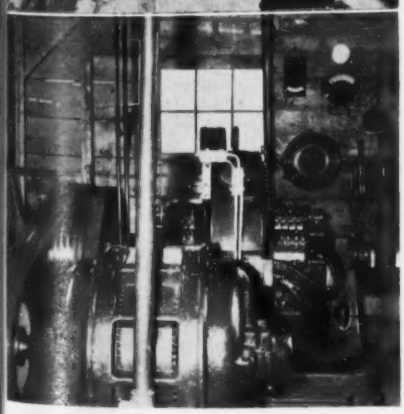

5

METALLIC copper in atomic particles penetrates the pores of the wood and protects it from then on from Teredo, marine borers, worms, termites or other insects in an electrolytic process developed by the Olympia Wood Preserving Co. of Olympia, Wash. and Hunters Point, San Francisco Bay. Right now the output of both plants is used by the Army and Navy. Piling, timbers and lumber are so treated now, but there is the future prospect of use of this electrolytic method for the treatment of poles, pole stubs, anchor posts as well as timbers, railroad ties and other wooden products subject to insect attack.

At Olympia poles up to 135 ft. long are treated. Briefly the process, pictured here, starts with rough peeling and smoothing with a wire brush. Timbers, ties, etc. are run through the teeth of the rollers shown here to puncture the surface. Piling is given the added treatment of No. 16 bare wire, rabbetted into a power saw cut groove, by means of a grooved wheel (Fig. 1) following the saw, and tamped into permanent place by a tap of a hammer to close the groove. Four such wires are embedded vertically in each pile, tacked at each end. Next comes a coat of graphite and metal paint (Fig. 2), another spiral, loosely wound, of No. 10 bare wire, then the poles are lifted into the electrolytic tanks (3), the end of the wires connected to the negative bus (4). The poles are held in the electrolyte, and curved cathode plates of copper are laid upon the spiral wire at 10-ft. intervals.

Anode plates of copper attached to the positive bus are suspended alongside the tank (6) and d-c from m-g sets (5) at from 2 to 6 volts, 1,500 to 2,000 amp., is turned on for three hours. A copper density of .05 oz. per cu. ft. is developed in the wood to a depth of 1 in. After the piling is in salt water the electrolytic action continues and copper penetrates, tests have revealed, to the heartwood. Samples of the treated piling are bored from the timbers, reduced to ash and the copper content ascertained. Timbers or poles not intended for immersion are not equipped with the copper wire permanently imbedded as this is designed to permit continued electrolysis in salt water.

Squared timbers are indented by these rolls before application of graphite

Invented in 1925, piling and timbers so treated, installed at that time in Teredo infested waters and in places where rot occurred, have survived unharmed while comparison untreated timbers have been consumed. Copper treated piling likewise is fire resistive.

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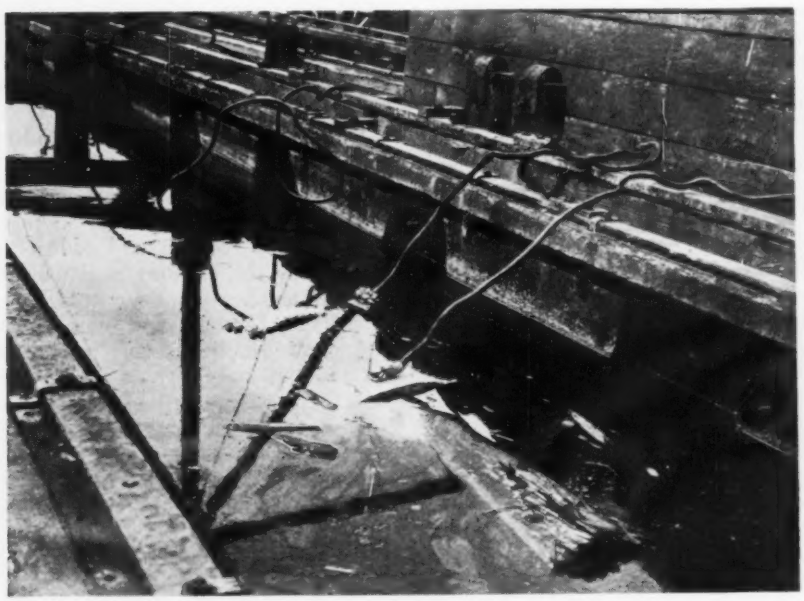


EMEA *Dope Sheet*

How to Set Up a Maintenance Program

*Howard C. Park**
Goodyear Tire & Rubber Co., Los Angeles

MAINTENANCE programs are not necessarily specific procedures which can be arbitrarily set up and prosecuted, with the expectancy that they will fit the requirements of any and all commercial services or industrial plants.

Maintenance programs should be molded to fit the individual electrical systems they are to serve and the manufacturing processes they are to provide.

Any programs that are adopted should be the result of prudent decisions reached after a thorough knowledge and comprehensive understanding is obtained of:

1. Electrical and mechanical *equipment* involved.
2. Various *services* that may be required.
3. Manufacturing *processes* entailed.
4. Raw *materials* used.
5. Finished or manufactured *product.*

A maintenance program should be initiated if it will provide one, or more, of three things: dependability, economy, or facility.

1. Dependability will *insure* consistent production.
2. Economy will *reduce* spoilage and *cut down* the production costs.
3. Facility will *expedite* production or *improve* the product.

Before we continue with this discussion, probably, we should first have a common understanding and conception of what is meant by maintenance.

Maintenance has been variously considered, or treated, as anything from a nuisance to a necessary evil. Probably, more often than not, it has been accepted as an industrial burden. This conception may be due to the impression the word itself conveys. It seems to imply holding together or sustaining something.

From the view point of management this impression, no doubt, has been greatly aggravated because maintenance has been constantly referred to as *non-productive* and consequently considered as an expense or liability instead of as an asset.

Whatever may have been the conception or consideration of maintenance in the past, there has been sufficient evidence provided by those who have been prudent enough to apply it wisely, to create a realization of the fact that few—if any—functions of industrial production contribute in a greater degree to the economic fabrication of the finished product, than does intelligent maintenance.

Maintenance as it is applied and practiced in efficient industrial production could, in reality, be more properly termed industrial electrical engineering. But, since maintenance has become the commonly accepted term, we shall set forth a definition and later describe its functions.

Definition of Electrical Maintenance

Electrical maintenance may be defined as the art of employing industrial and electrical engineering intelligently in a manner that will provide and insure electricity efficiently and economically to expedite and facilitate the processes of industrial production and commercial services.

Briefly, maintenance is a *service*, provided to *insure* efficient and economical production.

Or, putting it in a more concrete expression, maintenance is an *expediter* of production.

It will be noted, from the definition, that there are three definite functions of maintenance. Namely:

1. To *provide* and *insure* services.
2. To *expedite* and *facilitate* production.
3. To *promote* efficient and economical production.

In addition to these three functions of maintenance; it is generally the responsibility of the maintenance engineer also to provide the electrical system and electrical equipment required in the industrial plant.

Proper maintenance programs will, to a large degree, offset the supposed need of many changes and additions.

Probably the greatest responsibility the maintenance engineer now has is to use the system and employ the equipment which has been previously provided.

In the present emergency, he is confronted with the task of increasing production. In most cases, this maximum production must be attained without new or additional equipment with which to facilitate greater production.

If material shortages are to be overcome and, at the same time, production is to be increased he is confronted with a triple task.

He must first make the equipment perform the task it was initially designed to perform and then increase the number of hours of operation.

Secondly, the equipment must be employed in such a manner that the hourly production will be increased.

Thirdly, the increased hourly production and greater number of hours of operation must be attained with fewer man-hours of attendance and maintenance.

The question now arises, how can this be accomplished?

Production Efficiency

To do this job it will be necessary to give priority to efficiency. In other words, production efficiency *must* be attained.

Production efficiency can be insured by:

1. *Continuity* of equipment and production operations.
2. Providing *dependable* machinery and motive power.
3. *Correct* type of equipment.
4. *Convenient* and *precision* control equipment.
5. *Proper lighting,* which will facilitate *ease of seeing,* as well as provide *eye comfort.*
6. Last, but not least, to be provided is *safe* equipment, as well as *safe practices.*

In many cases, it may also be found that the proper control of load-factor, demand-factor, or power-factor will increase production.

In order for the maintenance engineer to discharge his responsibilities, he must arrive at prudent decisions of procedure. These procedures, or programs, must be based on knowledge of conditions and theory of the equipment involved. And, in addition, he must have means of knowing what the past performances of the equipment have been.

It should be the prime duty of the maintenance engineer to familiarize himself with the theory of operation and application of all equipment entrusted to his care.

The data required to provide avail-

* Presented at the Southern California War Production Clinic, at University of Southern California, Los Angeles.

able information on conditions and performance of the equipment are quite extensive. Consequently systematic methods of compiling such information are necessary. The following may serve as a guide to assist in forming an outline for compiling the information desired.

General System Information

The following general system conditions or factors concerning *supplied potential, current consumption*, and *circuit voltages* should be known or ascertained.

1. Total system connected load.
2. Maximum power demand.
3. When maximum and minimum power demands occur, and of what duration.
4. Load factor. *Hourly* as well as monthly.
5. Power factor of system.
6. Actual voltage of power supplied.
7. Voltage and voltage fluctuations should be known over entire 24 hour period, including week-ends.
8. Actual voltages of power and lighting circuits.
9. Is source of power dependable and adequate?
10. Is power available through more than one source of supply?
11. Is auxiliary power advisable for peak loads or emergencies?

Industrial Electrical System

An industrial electrical system consists, primarily, of three parts, namely:

1. Service equipment.
2. Distribution system.
3. Current consumption equipment.

Service Equipment

The service equipment consists of:

1. Power transformers.
2. Service conductors and service switch.
3. Main switchboard.
4. System ground.
5. Ground detector.
6. Metering.

Power Transformers

The following information on transformers should be ascertained:

1. What is type, rating, and capacity of power transformers?
2. What are primary and secondary transformer connections?
3. What voltage ratio taps do the transformers have?
4. What voltage ratio taps are in use?
5. What are primary and secondary voltages?

Operating conditions and characteristics should also be noted.

1. Are transformers clean and properly ventilated?
2. Are transformers located at economical load centers?
3. What are the operating temperatures of the transformers?
4. What is the dielectric strength of the insulating fluid?
5. What is the insulation resistance of the windings?
6. Is the capacity of the current carrying connection equipment ample?
7. Are the transformers properly protected against overload?

Service Conductors and Switch

1. What are sizes, capacities and length of service feeders?
2. What is type, kind and capacity of service switch?
3. What is type and rating of overload protective device?
4. What is present setting of overload protective device?
5. What is the present operating condition of the service switch?
6. If oil switch, what is dielectric strength of the oil?

Main Switchboard

1. What is size and current carrying capacity of bus bars or conductors?
2. What is type, size, capacity and load on main service switch?
3. Is each distribution switch clearly marked, indicating load serviced?
4. How many and what size spare switches are available?
5. What space is available for additional switches?

Grounding

Information also should be had on the grounding system employed. It is important to know the capacity of system grounding circuit. If the capacity of the power system is increased, the size of the ground feeder is very likely to be overlooked.

What type of ground detector is provided?

Distribution System

The distribution system employed may be any one of several different types, such as radial, load center, or network system. The feeders may be open wiring, rigid conduit, metal ducts or even bus duct. Whatever system of distribution or method of wiring may be used it will still essentially consist of main panelboard switches, distribution circuits, and load distribution centers.

The services rendered by the system may be divided into three general classes.

1. Power for motors, heating, welding, conversion and other similar equipment.
2. Energy for lighting.
3. Communications, alarm systems, and other low-voltage services.

Distribution Feeders

The following should be known of each distribution circuit:

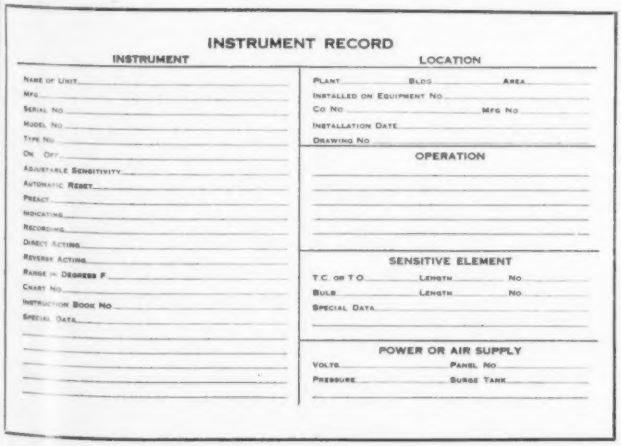
1. Type and capacity of feeder switch.
2. Size and present setting of circuit protective device.
3. Actual supplied voltage.
4. Voltage drop of the circuit.
5. Size and current carrying capacity of the conductors.
6. Length of circuit (one way).
7. Total connected load.
8. Maximum demand load.
9. Average demand load.
10. Power factor of circuit.
11. Insulation resistance of the circuit (megohm test).

TEST DATA

LOAD		VOLTAGE AB	VOLTAGE AC	VOLTAGE BC	AMPERAGE A	AMPERAGE B	AMPERAGE C	R.P.M.	KVA	KW.	P.F.	H.P.
Motor (No Load)	S											
	R											
Red. Gear (No Load)	S											
	R											
Present Load	S											
	R											

Tested by..... Date..... Air Temp..... Motor Temp.....

S—Starting
R—Running



INSTRUMENT RECORD

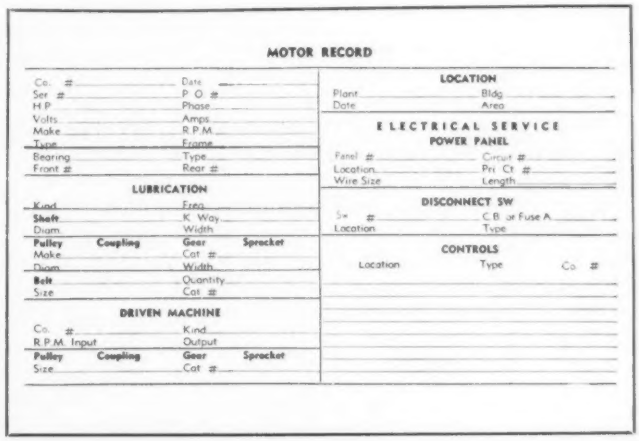
INSTRUMENT
Name of Unit
Mfg.
Serial No.
Model No.
Type No.
On Off
Adjustable Sensitivity
Automatic Reset
Preact
Indicating
Recording
Direct Acting
Reverse Acting
Range in Degrees F
Chart No.
Instruction Book No.
Special Data

LOCATION
Plant Bldg. Area
Installed on Equipment No.
Co. No. Mfg. No.
Installation Date
Drawing No.

OPERATION

SENSITIVE ELEMENT
T.C. or T.O. Length No.
Bulb Length No.
Special Data

POWER OR AIR SUPPLY
Volts Panel No.
Pressure Surge Tank



MOTOR RECORD

Co. # Date
Ser. # P. O. #
H.P. Phase
Volts Amps
Make R.P.M.
Type Frame
Bearing Type
Front # Rear #

LUBRICATION
Kind Freq.
Shaft K Way
Diam. Width
Pulley Coupling Gear Sprocket
Make Cat. #
Diam. Width
Belt Quantity
Size Cat. #

DRIVEN MACHINE
Co. # Kind
R.P.M. Input Output
Pulley Coupling Gear Sprocket
Size Cat. #

LOCATION
Plant Bldg.
Date Area

ELECTRICAL SERVICE
POWER PANEL
Panel # Circuit #
Location Pri. Ct. #
Wire Size Length

DISCONNECT SW
Ser. # C.B. or Fuse A.
Location Type

CONTROLS
Location Type Co. #

Load Distribution Centers

Essentially the same information is required for load-distribution centers as for main switchboard equipment. The principal difference is that distribution centers should be maintained as near to the center of the load as practicable.

Sub-Feeders and Branch Circuits

For sub-feeders and branch circuits the same information will be required as for distribution feeders, with the exception that the voltage drop from the main switchboard to the circuit consuming equipment should be known.

Current Consuming Equipment

Practically all current consuming equipment requires some method or means of control. Methods and types of control vary greatly in their application and use. It is essential not only to have full information of their types, performances, and method of application, but also to have accurate and simple diagrams or blueprints.

Lighting

Since lighting efficiencies are more critical to voltage variations than most other power requirements, the power is usually supplied by transformers and feeders independent of other heavy duty circuits.

Lighting plays a greater part in production efficiency than it is generally given credit for. It is one of the critical factors in facilitating speed and accuracy. Proper lighting will also reduce spoilage and accidents. Therefore, considerable consideration of application and maintenance will be justified.

Of each light circuit should be known:

1. The voltage at *load center* of each light circuit.
2. Is each circuit clearly and *correctly marked* at distribution panel?
3. Are control switches *conveniently* located?
4. Do lamp *voltage ratings* compare to circuit voltage?
5. Are light sources subjected to *excessive vibration?*
6. Are light fixtures *cleaned regularly?*
7. Are *lamp replacements* made systematically and promptly?

It should be noted that the function of lighting is not only to provide *visibility;* but, also to aid the *ease of seeing.* Consequently, the *type* of fixtures, *spacing* and *location* of fixtures, and the *kind* and *size* of light source which will provide proper illumination quality and adequate intensity is very important.

Motors

In addition to having full information and accurate, but simple, prints on the motor control equipment, it will be necessary to have:

1. The full name-plate data of the motor.
2. The invoice or company number of the motor.
3. Purpose or operation for which motor is used.
4. Kind and frequency of lubrication.
5. Motor amperage and horsepower (full load).
6. Motor starting amperage (with and without load).
7. Accelerating time.
8. Motor operating temperature.
9. Surrounding air conditions (dust, fumes, temperature, moisture, etc.).
10. Insulation resistance of motor.
11. Size and catalogue number of capacitor, if used.
12. Type and catalogue number of bearings.
13. Quantity, type and catalogue number of brushes, if used.
14. Shaft and key-way sizes.
15. Motor pulley, coupling, sprocket or gear size.
16. Length of belts or chain, if used.
17. Size of pulley, gear or sprocket of driven machine.
18. Kind or type of speed reduction equipment used.
19. Take-off rpm. of reduction drive (load side).

A master list should be made of all motors in service showing type, size, rpm., and style of bearing. An additional list of all spare motors should be made.

Additional Information

In addition to the information that has been listed it will be beneficial to have:

1. Daily log books.
2. Blueprints.
3. A system of equipment marking.

Log Books

A daily log book should be kept for recording trouble calls and services rendered. Means should be provided to record trouble and services on each piece of equipment. They should be tied down to each equipment record card.

Blueprints

Blueprints should be made of the electrical distribution system and all control devices. They should be complete and accurate but, at the same time, clear and simple.

Equipment Marking

Means and methods of clearly and accurately marking each

Transformer,
Switchboard,
Disconnect switch,
Contactor,
Control device, and
Electric circuit,

should be provided. The markings should be so devised that they will give an indication of the type of service or location of equipment they serve.

Summary

After the foregoing information is obtained and compiled it will be found that a record is available of all electrical equipment—

Where and how it is installed,
What its functions are,
What its physical and operating conditions are,
What its performances have been, and
What its limitations may be.

Such information may not include all the equipment of an industrial plant. But, it has been covered quite extensively with the hope of conveying an impression of the extent of the maintenance engineer's responsibilities. It has also been intended to create an impression of the various factors that are taken into consideration and analyzed *before* definite maintenance procedures are established. Setting up a maintenance procedure is like making a mold from the casting, rather than the usual procedure of making the casting from the mold.

Whatever programs are established for

Testing,
Greasing,
Servicing,
Adjusting, or
Cleaning,

their procedure and execution should be directed toward prevention of failures and facilitating manufacturing operations.

Even if the optimum is not fully reached, it may be possible so closely to approach it that it may again be said,

"Never before has so much been done with so little."

● REQUEST FROM THE REGIONAL federal housing administrator to use insulated open wiring in houses being converted to multiple dwellings under a government housing conversion plan was refused by the Civic Utilities Committee in Vancouver, B. C. The city's electrical bylaws require rigid conduits in apartment houses, hotels or buildings or more than two-family dwellings. Aldermen felt it would be unfair to allow special privileges to any one group. The city electrician L. H. Miller felt that as long as conduit was available it should be used.

● A POSTER to stimulate a feeling among employees to *'Keep 'Em Rolling'* has been prepared by the National Industrial Service Assn., the organization of motor shops, for posting on motor shop bulletin boards. On it is a reproduction of a letter from the War Production Board supplemented by strong inspirational copy to back up the war production job by keeping all industrial equipment in shape and operating.

Quick Pickup, Economy at Harbor Plant

Unit sets record for size of 3,600 rpm. condensing turbo-generators. New 65,000-kw. unit "underwrites" Boulder Dam power supply to Southern California. Electrical layout follows unit plan

C. P. Garman
Engineer of Design
Bureau of Power & Light, Los Angeles

DESIGNED to serve the dual purpose of quick pickup and standby in case of failure of Boulder Dam transmission or other source of power, and to provide substitute energy for Boulder secondary power, at times when not available, the Harbor steam plant of the Los Angeles Bureau of Power & Light, recently placed in operation, presents many new and interesting features in design, both from the steam and electrical standpoints. After a preliminary running up period starting in June, the first 65,000-kw. unit of an ultimate plant capacity of 350,000 kw., goes on the line for regular normal operation late in September as this is being written.

Of many noteworthy features, perhaps the one of first appeal is the fact that a tandem-compound condensing turbo-generator of such size operates at a speed of 3,600 rpm., making it the largest unit of its type manufacturers were prepared to build. Steam pressure and temperature, 850 psi. and 900° F., are not unusual, but noteworthy is the automatic combustion control equipment designed to restore heat to the steam generating unit in 10 to 25 seconds when the unit suddenly acquires full load from normal light load spinning operation.

Anticipation of the need for a steam standby plant several years in advance of actual requirements gave bureau engineers an opportunity to work out design in unusual detail, to the end that the new plant represents a good engineering balance of all factors involved. Preliminary studies of most suitable and economical structural design and plant arrangement were made by constructing a model to exact scale, and the highly important consideration of condenser cooling water was studied from a model that simulated tide conditions and actual water temperatures taken from harbor records over a period of years.

General Features

The plant, located at Los Angeles harbor in Wilmington, is designed for an ultimate capacity of 350,000 kw., the layout following the unit system wherever possible. Each unit will have its individual steam generator, turbine-generator, set of auxiliaries, step-up transformer bank, and outgoing underground cable. Plant facilities common to all units, such as the cooling water system and the electric control house, were installed with the first unit.

Total output of the plant will be delivered to station "C", 2½ miles distant, each unit of the plant being connected directly through its own 132-kv. underground cable to the receiving station. Underground cables, rather than overhead transmission lines, were selected because of the proximity of

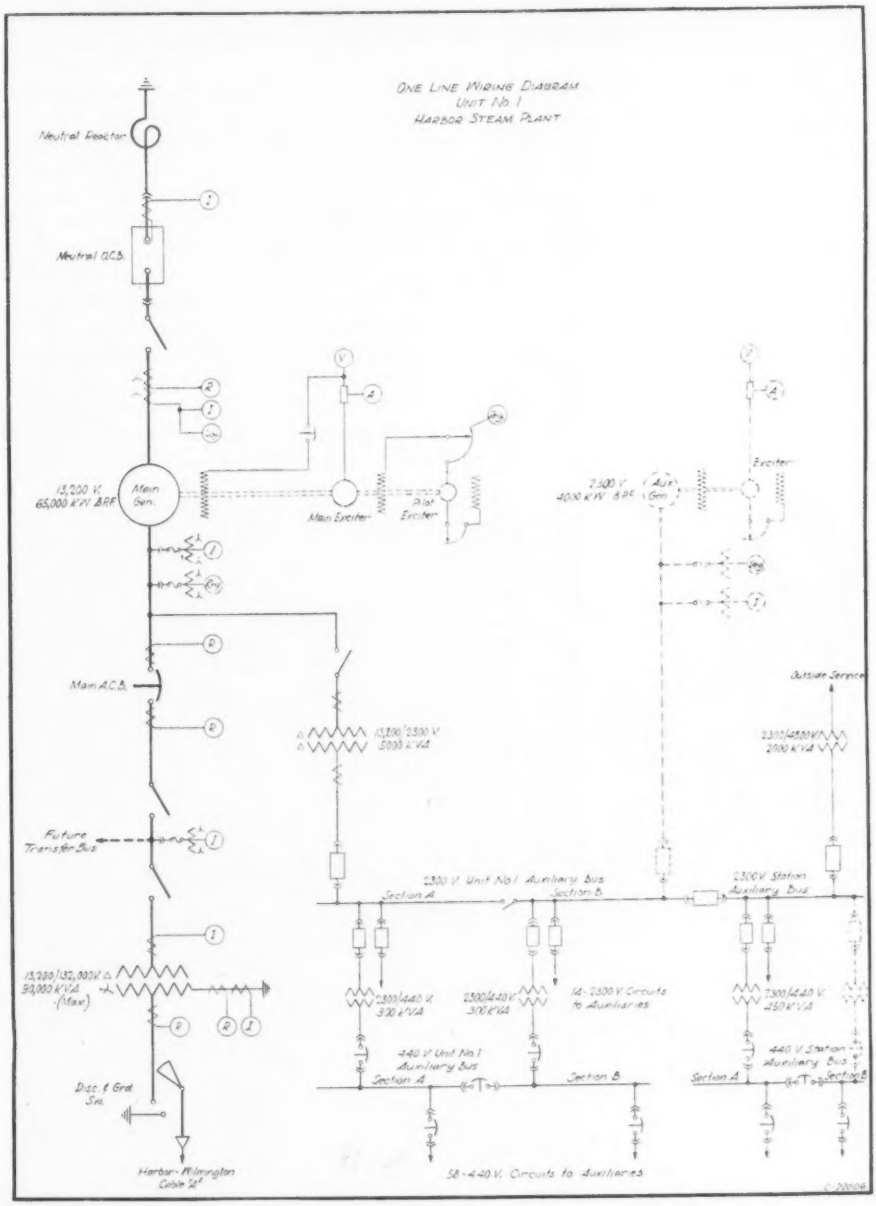
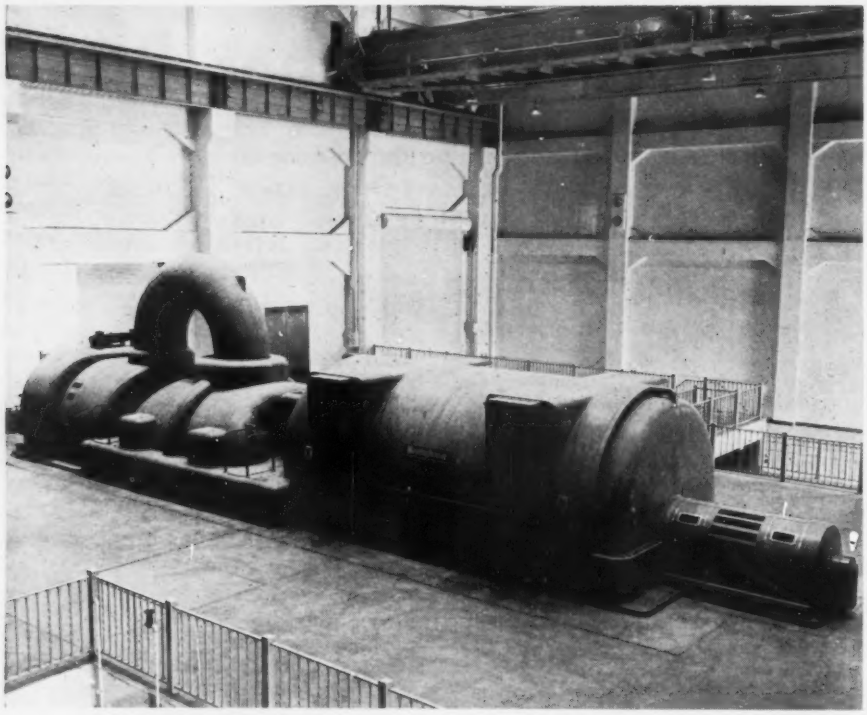


Diagram showing the general layout of power and auxiliary supply circuits

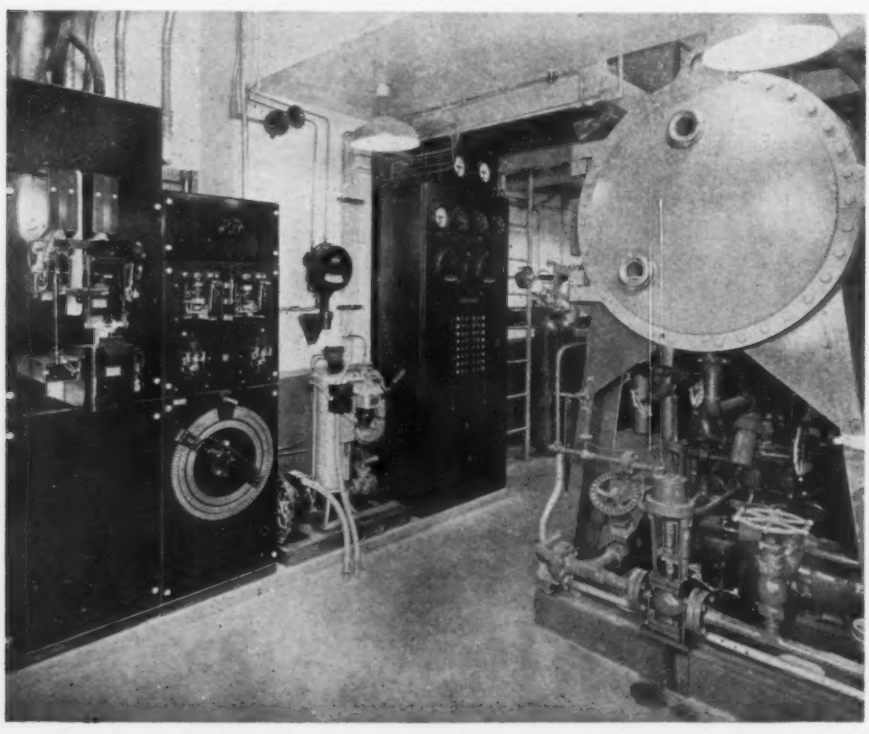


Quick load pickup dictated speed of 3,600 rpm. for 65,000-kw. tandem-compound hydrogen-cooled generating unit at Harbor plant. Shaft is over 60 ft. long. Unit first in 350,000-kw. plant

the steam plant to Los Angeles harbor, and the density of population between the plant and receiving station "C".

Predominance of hydro supplying the bureau's load and the manifest requirement for uninterrupted service were important factors influencing design of the first unit. Quick pickup was required in the event of failure of one or more of the 287-kv. Boulder lines or other transmission loss, yet reasonably good over-all efficiency was essential because of the need to supplant Boulder secondary energy with steam at times when the former is not available, and also the requirements for steam generation during periods of low run-off at other hydro plants on the system.

These considerations led to a thorough study of investment and operating costs at various fuel prices over a wide range of steam pressures and temperatures and at annual capacity factors ranging from 5 to 100%. Optimum design resulting from this analysis will give a calculated economy of 11,400 btu. per net kilowatt-hour at 75% load and fuel oil with 6,250,000 btu. per barrel.



Exciter field panel, hydrogen control panel and gland seal oil de-gasifying equipment in pit under main generator

Further studies indicated that a 3,600-rpm. unit was best suited to the required WR^2 characteristics for quick pickup, and that a tandem-compound unit would be most suitable for instantaneous pickup of full load since the rapid change in steam temperature from light load to full load will affect only the relatively small high-pressure turbine. Size of the unit was limited to 65,000 kw. by the fact that this was the largest condensing machine obtainable for a speed of 3,600 rpm.

Steam Features

The steam generating unit, designed to burn either fuel oil or natural gas, has a continuous capacity of 570,000 lb. of steam per hour, corresponding to 65,000 kw., and a two-hour capacity of 675,000 lb. per hour, corresponding to overload at 75,000 kw. Reserve capacity was built into the boiler to supply the necessary heat energy required for instantaneous pickup of full load. Automatic combustion control provides for heat recovery in from 20 to 25 seconds. Pressure at the superheater is 1,050 psi. gage and temperature 900° F.

The turbine operates at 850 psi gage and 900° F., but is designed to operate at 1,050 psi. and 900° F. at the throttle with a back pressure of 1.25 in. Hg. absolute. Load limiting and low-pressure limiting devices are provided. Steam is extracted at the 8th, 15th, 21st and 25th stages for heating feed water to 400° F. at 65,000-kw. load.

An innovation that reduced structural costs in providing for seismic shock was the use of twin condensers as shown by one of the accompanying photographs. This reduced the center of gravity and the mounting height of the turbine and generator by some 14 feet, a very important consideration, and permitted mounting of the condensers on a solid foundation without spring supports.

Main Generator

The generator is rated at 82,500 kva. at a hydrogen pressure of 0.5 psi gage, operates at 13,800 volts, 60 cycles, 3,600 rpm. By increasing the hydrogen pressure to 15 psi., rating can be increased to 93,750 kva. Exciter and pilot exciter are direct con-

nected to the main generator shaft. To permit replacement of brushes while the machine is in operation, the exciter is provided with duplicate brush holders.

Generator shaft extensions are sealed against hydrogen leakage by gland seals at both ends. Oil under pressure is pumped into the middle of the gland seals and flows both ways over the shaft, the flow being controlled by throttling rings. Leakage is negligible, the amount of gas required to maintain 95% purity being less than 100 cu. ft. per day. To remove the gas from the oil and prevent moisture from being carried over into the generator housing, the gland seal oil is vacuum treated in the so called "iron horse."

Because of the size of the generator, special construction was employed to reduce vibration and noise inherently present in all large two-pole machines. The stator core and winding, the source of double frequency vibration, was separated from the stator housing and supported in such a manner that the core can move radially with considerable freedom, but be rigid in the direction of torque loads. This construction reduced vibration to one-quarter that which otherwise would have normally been transmitted to the housing and generator foundation.

Rotor dimensions are of interest because of its unusual length, the total length being 24 ft. between bearing supports and the diameter 39 in. The turbine, generator, exciter and pilot exciter require a single shaft over 60 ft. in length.

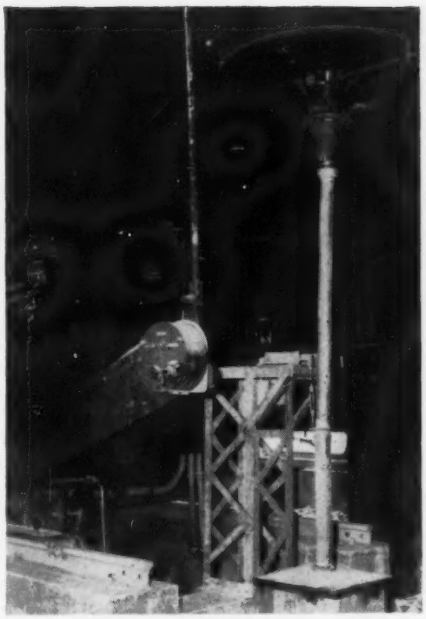
Generator Switchgear

The generator switchgear is located directly between the generator and the transformer bank, thus reducing the 13.8-kv. bus to a minimum length. The switchgear cubicle is totally enclosed, self-contained and houses a compressed air-blast type circuit breaker rated at 15 kv., 4,000 amp., 1,500,000 kva. interrupting capacity, with an over-all operating time of 8 cycles.

This type of breaker represents the latest development in circuit breaker design and has the added advantage of reduced space requirements and fire hazard. Compressed air storage within the switchgear is sufficient to operate the breaker for two circuit interruptions with the air supply cut off. The switchgear and the entire bus structure were designed to withstand a one minute 60 cycle test of 54,000 volts from live parts to ground. Continuous carrying capacity rating of the bus is 4,000 amp.

Step-up Transformers

The main transformer bank has a rating of 67,500 kva. self cooled, and 94,000 kva. forced-air cooled. The maximum rating is sufficient to carry the maximum output of the generator at 0.8 pf. The bank consists of three single-phase transformers connected delta on the 13.8-kva. side and wye on the 132-kv. side, with the neutral solidly grounded.



One of the single-conductor 132-kv. oil-filled cables entering the transformer pothead housing from underground duct system. Weight of the cable is taken and held at a constant pull by a scale mechanism which may be seen embodied in the latticed steel work near the lower end of the cable. The basket grip on the cable may also be seen. Fans are for transformer cooling

This arrangement permitted termination of each phase of the 132-kv. cables in a terminal compartment located on the rear of each transformer, as shown in one of the accompanying photographs, thus eliminating any exposure of high-voltage parts to the weather. This method reduces electrical hazards and maintenance arising from salt deposited on exposed insulation by on-shore winds from the Pacific.

132-Kv. Cables

The first two units of the Harbor steam plant will feed into the system at receiving station "C" through two 132,000-volt, oil-filled cables, each approximately 2½ miles long. Each cable has a maximum capacity rating of 132,000 kva., with both cables in service. Each single-conductor cable has an over-all diameter of 1⅓ in., and consists of 1,500,000 cir. mil hollow copper conductor insulated with 650 mils of oil saturated paper encased in a 180-mil lead sheath.

Each of the single-conductor cables which serve the first two units will be installed in 4½-in. fibre ducts. The fibre ducts are embedded in concrete and located around the circumference of a 16¼-in. circle to reduce the voltage induced in the cable sheaths by load currents and also to improve heat dissipation. A 3-in. duct in the center of the circle carries the oil alarm cable in a position which is substantially free from induced voltage under both normal and fault current conditions. Spans have a uniform length of 710 ft., except at corners, where half-length spans are used at the terminals.

Double manholes were used throughout to maintain complete separation of the two circuits. Two compartments were arranged end-to-end to occupy a minimum of street width while at the same time allowing ample space for expansion bends to absorb the expected cable movement of some four or five inches.

Each cable is divided into five sections by oil stop joints and gas-free oil is supplied to each section by gravity feed reservoirs mounted in the manholes. Float switches on the reservoirs operate a closed circuit annunciator system to insure prompt location of any abnormal oil level. This system operates through a special 24-conductor, telephone-type cable with petrolatum impregnated paper insulation, installed in the center duct of the conduit.

Continuity of the power cable sheaths is broken in each manhole by porcelain insulating rings built into the joint casings to limit the voltage available for electrolytic action to that induced in one span. Sheath bonding transformers are installed at all such points further to reduce the voltage between sheath and ground, and to provide a low impedance path for returning fault currents. As a further precaution, a six-phase spark gap is connected across the bonding transformer leads to limit any transient voltages due to faults or switching operations. These gaps are enclosed in air-tight housings to prevent ignition of any gas which may be present in the manhole.

Design of this 132-kv. cable installation is similar to that used for extensive 132-kv. feeder system recently installed to feed the western section of Los Angeles. The distinctly new arrangement of cables in the conduit system, span lengths, control of induced voltages and sheath currents, all were subjects of exhaustive studies and tests by the bureau's underground design engineers.

Auxiliary Power Supply

Power supply for auxiliaries is from a 5,000-kva. transformer bank connected directly to the terminals of the

Power is stepped up to 132 kv. and transmitted by cable to distributing station 2½ miles distant. The large metal compartment shown completely encloses the 132-kv. pothead and disconnecting-grounding switch on each transformer, preventing exposure to salt air and consequent maintenance as well as possibility of trouble

generator. A standby source of power from the outside system of limited capacity is also provided. Provisions have been made for the future installation of a 4,000-kw. steam turbine driven house generating unit. The unit has been purchased but its delivery delayed for the present by WPB.

Practically all auxiliaries are motor driven, divided into two voltage classes, i.e., 2,300 volts and 440 volts. Motors rated 100 hp. or more operate at 2,300 volts, all others, with few exceptions operate at 440 volts. The 2,300 volt switchgear, from which most of the auxiliaries are supplied, consists of the required number of factory assembled separate cubicles coupled together as one complete unit as shown in one of the photographs.

Each unit is equipped with a section of bus, current transformers and a removable truck type oil circuit breaker having an interrupting capacity of 150,000 kva. Meters and relays are mounted on the front panel of each cubicle. Interlocks are provided to prevent lowering or raising the breakers unless they are in the open position, and to prevent closing when they are being lowered or raised.

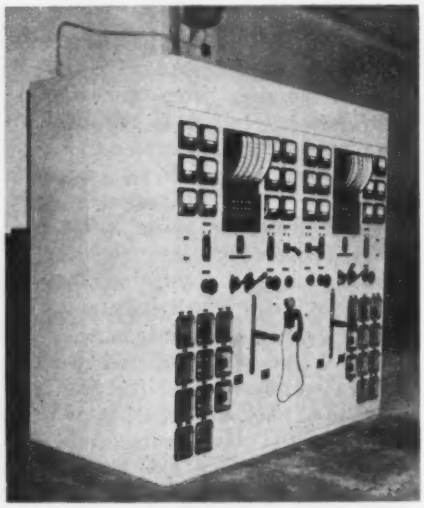
Distribution centers are established at convenient locations throughout the plant. These centers are served by duplicate feeders from the main 2,300-volt auxiliary service switchgear. All 2,300-volt feeder cables to the various distribution points are varnished cambric insulated with a Flamenol protecting sheath.

The 440-volt switchgear is fed from a three-phase station service transformer connected directly to the main 2,300-volt auxiliary service switchgear. It consists of a metal-enclosed structure containing the 440-volt bus and draw-out type air circuit breakers. The circuit breakers are mounted on rollers which permit their removal as desired provided the breaker is in the open position. These breakers have an interrupting capacity of 25,000 amp.

Both the 2,300-volt and 440-volt switchgear are designed with a sectionalizing switch in the center of the bus and have a supply source feeding either section. The auxiliaries are distributed between the two sections in such a manner that one-half of any switchgear may be taken out of service for maintenance and still permit operation of the balance of the auxiliaries.

Auxiliary Drives

Auxiliary drives are of interest because of the rigid requirements imposed by quick pickup. One of the important requirements to be met was the extremely wide range of pump and fan output required for picking up load from 5,000 kw. to 75,000 kw., and the rapidity with which the change has to be made.



Quick pickup imposed rigid requirements for controlling forced- and induced-draft fan speeds. This cubicle, through the automatic combustion control equipment, automatically regulates speed of forced- and induced-draft fans to within one-half of one per cent

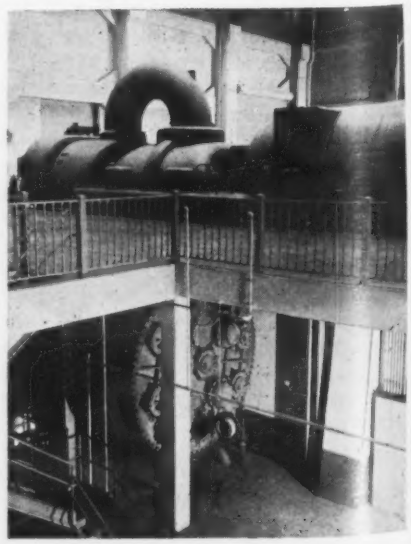
Studies indicated that insofar as possible all auxiliaries should be electric motor driven by single-speed squirrel cage induction motors. However, a flexible type of fan drive was needed to meet requirements established by the steam design engineers for the forced- and induced-draft fan drives. These were that acceleration from 0 to 95% speed be made in 14 seconds and that speed be controlled over the full range within a limit of one-half of one per cent variation between steps.

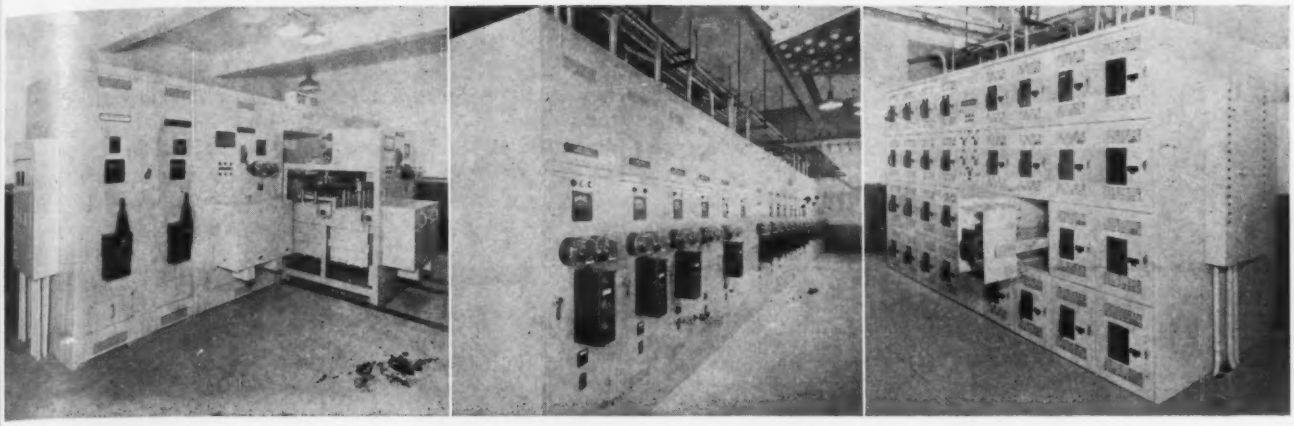
Various types of drives were examined from the standpoint of reliability, adaptability and cost. It was found that the Ward-Leonard type of control would best meet requirements. Equipment selected consists of two motor-generator sets, one for each pair of forced- and induced-draft fans. Each m-g set has a 1,000-hp. motor coupled to two d-c generators. One generator furnishes power to one induced-draft fan and the other to the related forced-draft fan. Each d-c generator is solidly connected to its respective fan drive motor.

Operation of the speed control system is as follows: Under normal conditions both m-g sets will be running and the speed of each of the fan motors will be controlled by the magnitude of the voltage of its respective generator. The magnitude of each of these voltages is in turn controlled by a "Regulex" type exciter. Each fan motor has a direct-coupled tachometer generator, the output of which is balanced against the output of its respective speed exciter. The differential output of the two units controls the output of the Regulex generator, which in turn directly controls the voltage of the main generator driving the fan motor. When the outputs of the two generators are balanced, the system is stabilized for that requirement of load, since the fan speed matches that called for by the automatic combustion control equipment of the steam-generating unit.

Provision is made for the manual operation of rheostats individually and

Turbine and condenser arrangement. A similar condenser is installed on the opposite side of turbine foundation. This arrangement lowered center of gravity which was desirable from standpoint of seismic disturbance, and reduced height of building by 14 ft.





Factory assemblies were used throughout for 2,300-volt (left) and 440-volt (right) auxiliary switchgear. Truck type oil circuit breakers were used in the 2,300-volt cubicles and air breakers on the 440-volt. One of each is shown in the draw-out position. Center: Main 2,300-volt auxiliary switchgear

independently of the combustion control equipment if hand control is desired. All of the control equipment for the m-g sets is installed in a metal-enclosed cubicle containing also the protective and timing relays and meters.

All essential auxiliary motors can be started and carry full load for three minutes at 70% normal voltage, since low-voltage conditions are most likely to occur at the time of quick pickup and maximum auxiliary load. To provide for wide range in load, the two fuel oil pumps are driven one by a constant-speed motor and the other by a two-speed motor. The three fuel oil transfer pumps are driven by constant-horsepower, two-speed motors. The two speeds provide for difference in viscosity of the oil.

Control House

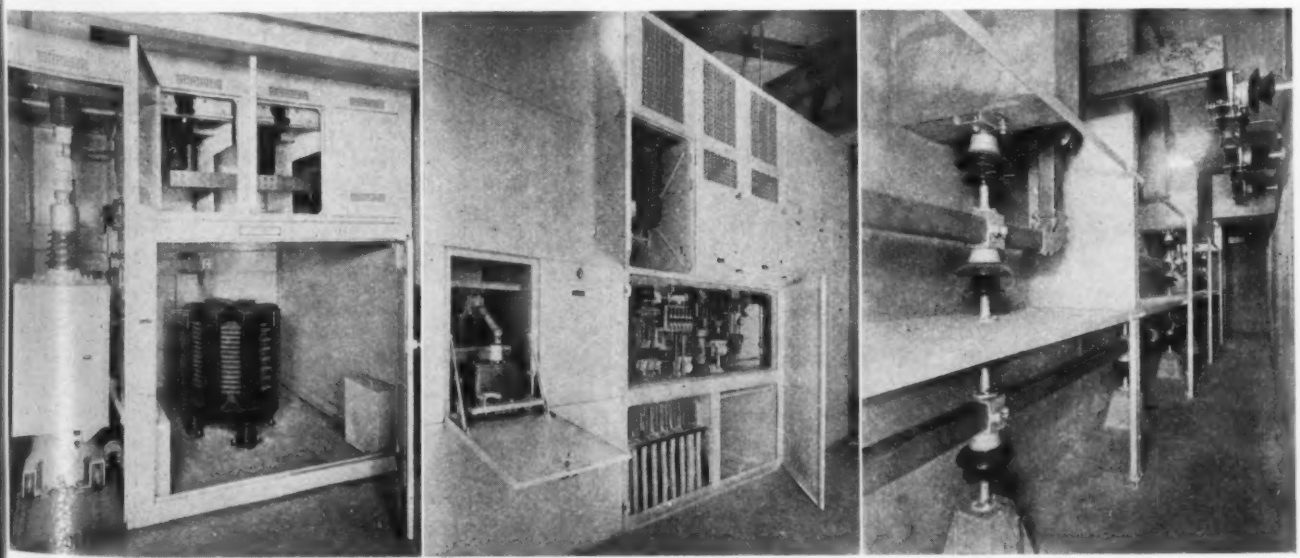
The control house, located separate from the main plant, is centrally located with respect to the ultimate plant. A large room contains a radial control board for the generating units. It contains also the control boards for the auxiliary power supply circuits to the 2,300-volt and 440-volt switchgear, the station battery and charging equipment and a temperature recording meter board. Individual auxiliary drive motors are controlled from convenient locations throughout the plant.

Three communication systems provide a two-way signalling system for communication between the control room and operating points throughout the plant. One system consists of a number of luminous panels with proper wording inscribed thereon, the illumination of which are controlled by push buttons; another is the automatic intercommunicating phone system, including the features of an autocall and executive priority service; and thirdly a manual telephone system with direct communications from the operator's desk in the control house to the turbine room, boiler board and other important locations. Provision is also made for transmitting the total load indication of the plant to the dispatcher's office in Los Angeles.

Fire Protection

A number of points throughout the plant, designated as fire hazard locations are protected by a Cardox fire protection system. This system consists of a storage tank containing four tons of CO_2 maintained at 300 psi. gage by refrigeration together with the necessary piping and nozzles. Thermostats at these hazard locations control the valves for admission of liquid CO_2 to the nozzles. The quantity of CO_2 to the locations is regulated by an automatic timing device.

Harbor steam plant provides both additional firm and standby energy for southern California war plants and becomes an important addition to the generating facilities of the Bureau of Power & Light of the Los Angeles Department of Water & Power.



Neutral reactor (left) and neutral circuit breaker cubicle located in the generator foundation just below generator terminals. Center: Main generator cubicle that houses the 1,500,000-kva. air-blast type generator circuit breaker. Center opening shows control equipment for air valves. Right: 13.8-kv. bus tunnel showing risers to main transformer bank. Bus serves to close delta

Fire Fighting by Scientific Methods

Hawaiian Electric trains employees in methods and equipment. "First aid" equipment and types of fires are analyzed. Actual fire fighting is part of training

Herbert Heinrich
The Hawaiian Electric Co., Ltd.,
Honolulu, Hawaii

PRACTICALLY every fire can be extinguished within the first few minutes if proper equipment is brought into service by men who are trained in its use. Successful extinguishment of fires does not, in general, require elaborate, expensive equipment. The essentials are the right kind of equipment (suited to the existing hazards) kept in good condition, in the right place, and with men trained to use this equipment and to bring it into service immediately after the fire is discovered.

To prevent property and production losses and to protect personnel, it is necessary to have the men of a plant fire organization trained in fire prevention as well as in fire fighting. It is necessary to make certain that all men involved understand the working principles of the fire equipment installed and its proper use. However, no matter how well the plant is equipped with fire fighting apparatus, or how well trained the men may be to handle this apparatus, it is of utmost importance that the public fire department be notified immediately when fire is discovered, unless the plant has a full-time company fire department.

Modern fire fighting as applied to utility stations is based on the application of various first aid fire appliances, which, if handled correctly when fires are in the incipient stage, will minimize losses. These first aid devices commonly called "fire extinguishers" are designed to cope with fires in their early stages.

There are various types of appliances and each is of value. However, not all types are equally effective upon various kinds of fires. Consequently, when providing such equipment, consideration should be given to the class of fire which may occur due to the nature of the equipment within the plant.

It is of vital importance that employees be instructed in the proper use of the various extinguishers. Through periodical instructions and demonstrations, persons who may be required to use such appliances will become more familiar with the units and thus, despite the excitement of a fire, be prepared to accomplish the maximum of fire extinguishment in the minimum of time.

Classes of Fires

For all practical purposes, there are three general classes of fires, as established by the classification plan recommended by the NFPA:

1. Class "A" fires are defined as fires in ordinary combustible materials where the "quenching" and cooling effect of quantities of water or solutions containing large percentages of water is of first importance.

2. Class "B" fires are defined as fires in flammable liquids, greases, etc., where a "blanketing" effect is essential.

3. Class "C" fires are defined as fires in electrical equipment where the use of a "non-conducting" agent is of first importance.

Employees are trained to know types of extinguishers and the proper use of each type

Utility plant fire squads may be called upon to combat any one of the three classes of fires. Some of the first aid appliances and their usages are as follows:

Types of Extinguishers

Class "A" Fires:

1. Fire pails. Pails of water are the simplest and oldest form of fire extinguishers. Everyone knows how to use them. They are limited to fires which may be reached readily by liquids thrown or poured by hand from a pail.

2. Pump tanks. They are especially useful where fire pails may not be effective such as with overhead fires. They should be inspected weekly and should be operated at least monthly.

3. Soda-acid extinguishers. Hand extinguishers of this type use a powdered chemical (sodium bicarbonate) dissolved in water for the extinguisher shell, and a liquid chemical (sulphuric acid) for the bottle. The extinguishing agent is principally water, with the products of the chemical reaction in solution. They can be carried to the fire by means of the top handles and then inverted for use. When the chemicals mix as a result of this operation, pressure is created within the unit which expels a stream of solution through the hose. The stream can be directed effectively from a distance of 30 to 40 ft. horizontally. They should be inspected once a month to see that the hose nozzle is not plugged and to ascertain that they are full. They should be discharged, cleaned and recharged at least once a year. This should be done before the employees as part of the fire prevention program.

Class B Fires:

1. Fire pails. Pails of sand are effective on small oil fires. They are limited to fires which may be reached readily by sand thrown by hand from the pail.

2. Foam extinguishers. These extinguishers are similar in outward appearance to soda-acid extinguishers, but can be distinguished clearly if given a particular color. This should be done because a mistake in identity may be disastrous. As in the soda-

acid type, the main tank holds a solution of sodium bicarbonate except that a foaming agent and sometimes a preservative is added. Inside, in place of the acid bottle, is a long metal tube containing a solution of aluminum sulphate. The extinguisher is operated by reversing, which results in the two solutions mixing and causing a pressure to be created which forces the foam through the hose.

The foam consists of small bubbles of CO_2 and is about seven and one-half to eight and one-half times the volume of the original solution. It forms a flexible blanket which excludes air, thus extinguishing the fire. Foam from the soda-acid solution is a conductor of electricity and is especially dangerous if applied to live apparatus. It should be applied gently to the wall of the tank or container so that the foam may spread naturally back over the burning liquid. The extinguishers should be given a monthly inspection to make certain that they are full and that the nozzles are free, and a yearly recharge and thorough cleaning.

3. Carbon tetrachloride extinguishers. These extinguishers are available in various sizes and consist of a tank with a handle pump. The extinguishing agent is a specially treated non-conducting liquid having a carbon tetrachloride base with important components for compressing the freezing to 50° F. below zero, avoiding corrosion, etc. The solution applied to a fire forms a heavy inert gas which envelops the burning material, excluding the air and extinguishing the fire. The gas liberated is toxic and should not be inhaled to any great extent. The stream should be directed at the base of the flames and never directly into the burning liquid. The extinguishers should be checked once a month to ascertain that they are full. Once a year, they should be checked for pump action.

4. Fog nozzles. This type of extinguisher utilizes water under pressure which is forced through a special nozzle that breaks the water up into a fog. The fog when directed into a

Above are two means of fire fighting. left: Modern method of using water spray. Right: Soda type extinguisher

fire of burning oil will serve a twofold purpose, namely, it smothers and it cools. It is very effective on oil and gasoline fires.

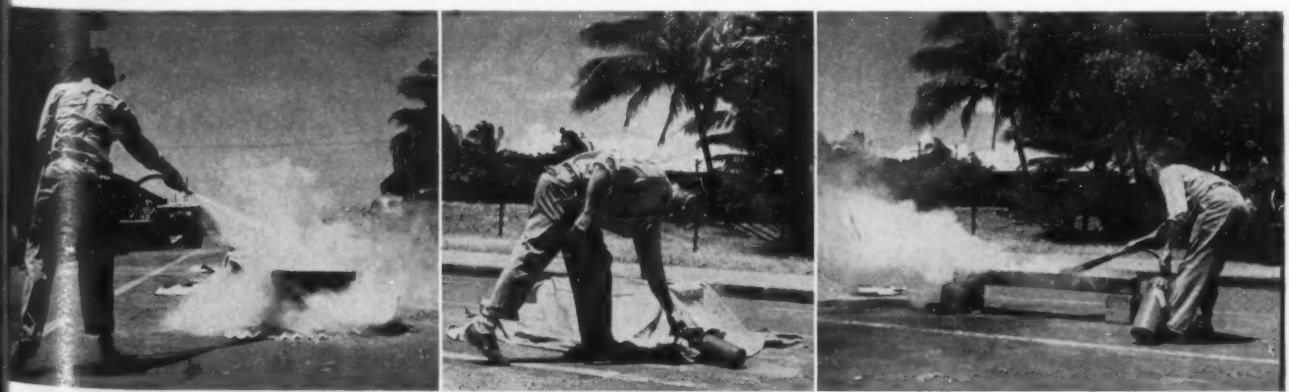
5. Steam nozzles. Steam can be used to good advantage when piped to oil storage tanks for smothering oil fires. The valves controlling the steam lines should be located in an accessible place some distance from the oil containers. These lines should be equipped with suitable drains.

Class "C" Fires: All Class "C" fires which occur in electrical apparatus should be fought with the circuits deenergized if at all possible to do so without the loss of too much time. This will prevent a loss of life and result in a minimum time to bring the fire under control.

Two extinguishers are outstanding for service on this type of fire and can be used successfully in Class "B" fires also. They are the CO_2 and dry chemical types.

1. Carbon dioxide extinguishers. Portable CO_2 extinguishers are available in many different sizes. They contain their rated capacity of CO_2 in ICC approved steel cylinders under a pressure of approximately 850 lb. per sq. in. at normal temperature. The smaller sizes can be carried while the larger sizes are wheeled or set in racks with their outlets manifolded and piped to one or more hose reels mounted on the wall.

The discharge produces a local high concentration of inert gas which displaces the air. The fire is thus deprived of the oxygen necessary to support combustion. The gas should be applied to the base of the flames and with a sweeping action to get the flame off the burning object. It is non-injurious, non-corrosive, a non-conductor of electricity, rapid in action, will not deteriorate with age and need not be protected against low temperature. It is useful in extinguishing fires in valuable equipment which might be damaged by other extinguishers. Precautions should be taken to prevent inhaling the gases produced inasmuch as they do not provide the necessary oxygen. CO_2 is very effective in combating fire in electrical machinery and



Most effective of all methods was the Du-Gas extinguisher, shown at extreme left. Center: Asbestos blanket smothers oil fire with the aid of CO_2 extinguisher. CO_2 is effective also on oil fires as shown at right, below

transformer vaults. When utilized for this purpose, extinguishers are usually controlled automatically through the action of thermostats. Prompt application of CO_2 may save expensive windings with the resultant outages. The cylinders should be checked semi-annually for weight of gas.

2. Dry chemical extinguishers. These portable appliances, hand and wheel types, use as an extinguishing agent a patented preparation of sodium bicarbonate which has been treated with a small percentage of other ingredients to make it flow readily and resist caking or absorption of moisture. The hand units use CO_2 as an expellant. When operated, they discharge a continuous and uniform heavy dust stream or cloud together with gas over the burning material which tends to smother the fire. These extinguishers are used in the same manner as the CO_2 extinguishers and for the same purpose. They have the advantage over the CO_2 type that the effect of wind does not detract from their effectiveness inasmuch as the powder quickly covers the burning area and "quenches" the flame. The extinguisher should be checked semi-annually for weight of the CO_2 expellant and condition of the powder. When recharging, the plant employees should operate the extinguishers so that they become familiar with the operation.

It should be emphasized that fire prevention work should be carried on at all times. For example, before a job is started in any section of the plant, the fire marshal should survey the location and type of work to be performed and determine the potential fire hazards and then recommend what precautions should be taken to prevent fires, as well as to make certain that the proper first aid fire extinguishers are handy in case a fire should start. A fire watch should be kept during all welding and cutting jobs to render first aid when cuttings or welding sparks might ignite any nearby combustibles. It has been experienced that these simple precautions have prevented many costly fires and their accompanying outages.

AIEE Meeting Stresses Electronics

Carrier relay protection, new one-cycle relay, electronic motor control, simplified a-c network calculator, industrial applications, metallurgy and lighting are discussed

WAR created problems for the electrical engineer and wartime solutions, together with postwar applications of new developments, occupied attention of the 190 delegates who registered for the three-day national technical meeting of the AIEE, held at Salt Lake City, Sept. 2-4 Several papers on electronic applications were presented. Notable of these dealt with a new type carrier relay protection, application of 720-cycle carrier to power distribution circuits and electronic control for d-c motors.

National President E. N. Funk declared that the electrical industry is really going to give the public plenty of beneficial surprises after the war. A great many things are being done now that we can't talk about because of the war, he said, but some of the interesting new discoveries will be applicable to the home. Too much emphasis is being placed on power costs so far as the nation as a whole is concerned, he stated, and pointed out that power cost is not necessarily a determining factor in most manufacturing industries. Major costs are labor, transportation and raw materials, said Funk. He does not expect any material reduction in power rates because of increasing production costs and constantly mounting taxes. He warned not to forget that the majority of power is still, and will continue to be for a long time, produced by fuel, and that fuel costs are high.

A new one-cycle relay that assures practically instantaneous clearing of line faults, operating by superimposition of a relaying function on the usual voice carrier communication system was described by Canadian engineers. This is accomplished by means of the trip-transfer principle with impedance relaying and the scheme was cited as a practical method for securing maximum service from a single carrier installation. Application of 720-cycle carrier for remote control of street lights, off-peak loads and other services, with particular reference to performance on urban distribution circuits was described by F. J. Woodworth, General Electric Co. Of special note were the methods presented for coordinating the joint application of power factor correction capacitors and carrier control on the same system.

The difficulty that we would have in meeting present needs for speed and accuracy in the production of metal items without the use of electronic control equipment was brought out in a paper by R. H. Rogers, General Electric Co.

Electronic control of d-c motors was discussed by K. P. Pachlowski, Westinghouse. He described the use of an ignitron rectifier with smaller exciter ignitron as the source of d-c power and speed control for d-c motors used in many intricate and exacting industrial processes. With electronic control thus applied it has been possible to effect a nicety of speed control and delicate response heretofore unobtain-

Above: C. A. Powel (left) of East Pittsburgh, confers with F. E. Bodine, Salt Lake City. Bodine was entertainment chairman for the AIEE conclave

Below: E. W. Schilling (left), Bozeman, Montana, AIEE national vice-president, with B. C. J. Wheatlake. Wheatlake presided at the opening session in absence of Dr. A. Leroy Taylor

able. Standard package units up to 5 hp. are now obtainable.

Operating Problems—Experience

Included in the new devices announced at the meeting were a small simplified a-c network calculator and a one-cycle directional over-current relay. Waldo Enns, Portland General Electric Co., described a calculating board of unusually small physical dimensions and simple electrical elements which promises to fill the gap between tedious analytical methods and use of the complete a-c board for making system load flow studies.

W. C. Morris, Westinghouse Electric & Mfg. Co., told of a new relay which incorporates a "memory" action in addition to directional control and is practically foolproof under any ordinary system operating condition.

Operating experience with dethermalizing arc quenchers on circuit breakers ranging from 16 to 230 kv. was cited by L. F. Hunt, Southern California Edison Co.; C. P. Garman, Los Angeles Bureau of Power & Light; and F. H. Cole, Cole Mfg. Co., as indicating a means of obtaining minimum maintenance expense and maximum system protection from existing breakers. Shorter interrupting time with no deterioration of the oil, contacts or insulating materials of the interrupters has been obtained through the application of these devices.

A warning that lightning surges may be transferred from one circuit to another through transformers with disastrous results to rotating machines or industrial equipment of inherently low impulse insulation level was given by P. L. Bellaschi, Westinghouse Electric & Mfg. Co. He described tests, gave simplified methods for calculating transferred surges and suggested protective measures.

How improper relaying may upset a system due to mutual induction on parallel transmission lines on current flow to ground faults was described by J. I. Holbeck and M. J. Lantz, of the Bonneville Power Administration. Diagrams and examples indicated the effects and magnitude of mutual induction.

Operating experience with transmission and switching equipment at high altitudes, a problem of particular importance in the Rocky Mountain region where lines frequently cross 10,000-ft. passes, was presented by L. W. Robertson, Public Service Co. of Colorado. Of special interest was the behavior of lightning at those altitudes.

Power savings of 25% together with operation of 75% more welders without increasing maximum demand are possible with the use of an automatic welding machine starter, according to N. E. Porter, Permanente Metals Corp., who told of the use of these devices on hundreds of welders in the Kaiser Pacific Coast shipyards.

Left to right: W. C. Smith, San Francisco, retiring vice-president Eighth District; H. H. Henline, New York, national secretary; National President N. E. Funk, Philadelphia; E. W. Schilling, Montana, national vice-president J. A. McDonald, Salt Lake City, conference publicity chairman

That wartime electrical developments in the aircraft industry presage possible postwar applications of new equipment in other industries was the consensus of a conference on electrical equipment for military aircraft. This is especially true in the case of new cables and small, light high-powered motors.

Metallurgy—Lighting

A conference on metallurgy of copper and light metals as applied to electrical equipment brought out the fact that too little attention had been paid in recent years to copper as a metal. Papers by P. H. Brace, Westinghouse Electric & Mfg. Co., and E. R. Parker, General Electric Co., stressed the effects of small quantities of impurities on the ductility, strength, and conductivity of copper and discussed the metallurgical problems in its refining. The production of ferro-alloys in the western states was the subject of an interesting paper by S. F. Ravitz, U. S. Bureau of Mines, who placed particular emphasis on the uses of these alloys in production for war.

H. W. St. Clair described the work of the U. S. Bureau of Mines in pioneering the production of magnesium and aluminum from local sources. A method of obtaining mass production of alumina from low-grade clays has been perfected, and a plant has been constructed in the vicinity of Salt Lake City, Utah, with a capacity of 100 tons of alumina per day.

A similar conference on lighting indicated that the industry is at the front of the movement to conserve critical materials as instanced by the trends in industrial lighting. The development of fluorescent lighting units and the application of voltages as high as 460 volts to lighting systems results in better performance and the saving of tons of copper and other scarce materials. The uses of electricity in the metal and coal mines of Utah, and the use of ultraviolet light in the analysis of ores were discussed.

The meeting was well rounded out with inspection trips and entertainment with the Salt Lake Section as hosts. Included was a trip to the Utah Copper Co.'s mines, mills and smelter and inspection of the U. S. Bureau of Mines, laboratories and shops.

A. C. Kelm, Salt Lake City, conference finance chairman; Secretary Henline; A. L. Jones, Denver, past vice-president: Dr. H. T. Plumb, Salt Lake City, chairman of technical program

Wartime Service Instructs Customers

Residential crew, district at a time, aids users to conserve their appliances, replace fuses; obtains postwar market data

HAVE you tried to find an electrical appliance lately? Even the hidden second-hand and pawn shop derelicts have been salvaged and put to use. The slogan, *Make it last* has real meaning these days. It was to furnish its consumers with information on the proper use and care of their electrical appliances in order to extend their life until such time as new ones are again available for sale that the Los Angeles Bureau of Power & Light initiated its "wartime service program." A preliminary survey indicated that many appliances were not in use because minor cord or plug repairs were necessary. Since appliance repair shops were receiving more work than they could conveniently handle, it was decided that minor cord repair should be a part of this service.

With a relatively small group of employees, it obviously was impossible to call on all domestic consumers. It was, therefore, decided the calls should be limited first to those residences wired for a major appliance and where records showed no major appliance in use, then to new consumers moving into residences wired for major appliances, and finally to consumers requesting this service. By contacting those consumers first it is possible to keep records of major appliances up to date by locating appliances which have been moved onto the bureau's system or which have been moved from other locations onto the system and not previously listed; in those residences where no major appliance was being used the consumer could be informed of the value of the major appliance wiring and their eligibility to purchase new appliances.

Considerable thought was given to the points of information most valuable to the consumer, and the following items finally were incorporated in the service procedure:

1 Location of main switch and fuses and explanation of their purposes.

2 By means of a fuse chart, label the circuits and indicate correct fuse size, explain function of fuse, the reasons for using fuses of the proper size, the proper method of fuse replacement so the consumer can do this himself, thus restoring service sooner and conserving time and transportation for petty troublemen.

3 Inspection of appliances, including repair of cords and plugs, and instructions on lubricating, cleaning, proper care and use. Referring consumer to dealer for those appliances needing extensive repairs, again demonstrating the bureau's efforts to cooperate with dealers.

4 Inspecting of lighting in the home, giving suggestions for improvements and an explanation of dimout regulations.

5 Listing any appliances which are not needed and which the consumer is willing to sell.

6 Locating, if possible, any needed appliances and listing postwar prospects.

7 Reporting of all major appliances of which the bureau has no record.

8 Answering questions and complaints.

9 Explaining other services furnished for the consumer's benefit.

To carry on this work the consultants were equipped with smocks for identification and for protection of clothing, small tool boxes, circuit charts, recording material and a list of dealer service stations, repair shops, and authorized factory service stations. The tool box contained screw drivers, pliers, test lamp, flashlight, knife, scissors, tape, machine oil, fuses and small brushes.

The group operates from a branch office headquarters, covering one district of the city at a time. Several days before the call is to be made a letter is sent to the consumer explaining the purpose of the call and the approximate time it will be made. In most cases this gains admission and saves time. Wherever possible the rear door is used because, in mose cases, the service equipment is located at the rear of the house in the service porch and instructions can start from that point, with the homemaker assisting in the circuit check; also, the majority of appliances are in the kitchen.

Personnel consists of a supervisor and nine electrical service consultants

Instructions are given in the care of appliances to make them last. Questions are answered to complete satisfaction

Tool kit carried by each of the residential contact crew contains fuses and tools for minor repairs to cords, etc.

—seven men and two women. The consultants were selected because of their previous experience and familiarity with small appliance servicing. They were given a short, intensive refresher course, which included an inspection of the larger appliance service stations to become familiar with up-to-the-minute problems and conditions of appliance repair and so better to advise the consumer of the common neglects which cause appliance failures. The women were selected because their viewpoint would be different from the men's and improvement would result from discussions within the group. Because of the consumer's favorable reaction and expression of appreciation to the consultants, they are all enthusiastic and consider their work beneficial and essential.

During the trial period (60 days) surveys were made in all districts served by the bureau to get a cross section of the need for this program and of the consumers' reactions. In every district the results have been gratifying. A total of 1,292 surveys has been completed, 343 kw. of connected load have been restored to use by minor repair, 179 kw. have been referred to dealer service stations, and a total of 4,836 appliances were inspected, 1,009 fuse recommendations were made, 563 improvements in illumination were suggested, and many of the consumers indicated they planned on the future purchase of an electric range or water heater.

Many of the appliances inspected were found to need attention which, if delayed, would have caused a failure; many others were being kept in operation by temporary means because the consumer did not want to do without the appliance.

A complete tabulation of the results accomplished by this service program, of which the above is only a summary, indicates that it is serving a need and that the consumers are very appreciative of the information furnished, realizing the value of their appliances and the necessity of keeping them in proper operating condition by proper use and care. There are many appliances requiring attention, and the present overloading of repair shops can be relieved to a great extent by assisting and instructing consumers as the bureau is doing. When it is necessary to have appliances repaired, furnishing the consumer with location of repair shops and authorized factory service stations saves consumer's time and transportation.

This service program is furnishing an indication of the appliances which will be needed as soon as production is resumed, and has already demonstrated its value both for the electric consumer and for the bureau as well.

Smock and tool kit in hand, the crew starts from one of the offices for the day

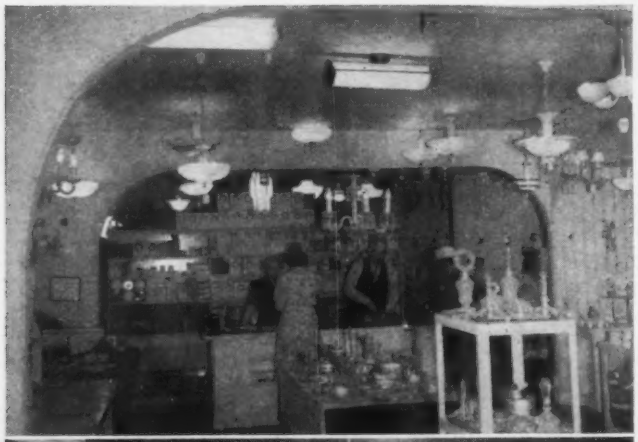
New Directory Issued

As a further aid to the consumer in his effort to make his appliances last, as well as to help the repair service dealer, is a new directory of electric dealer service centers and appliance repair shops just compiled by the bureau staff. This directory has been placed in the hands of department stores, dealers, offices of the bureau and the wartime service personnel. It is a complete, cross-indexed reference guide as to service shops, their names, locations, telephone numbers, and the class of service handled by each.

The first part of the directory lists these repair shops alphabetically, indicates their district number, phone, and codes the appliances they repair—radio, refrigeration washers-ironers, vacuum cleaners, miscellaneous small appliances. There is a column for remarks such as to indicate what makes they are authorized repair shops for, whether they handle wiring and fixture repairs, motors, have stocks of parts, or whether their service is limited to controls only.

In the center is a map of the city in which the districts are zoned into eight areas. There follows a section in which the dealers in each zone are listed under product classifications. This enables anyone advising a consumer to offer her a list of repair shops in the district in which she lives in order to save transportation and time. This directory supplements the earlier *Electrical Dealers' Service Index* which listed authorized factory service stations by product and trade name.

A repair is made to a cleaner cord, above; below, circuits are charted and woman shown how to replace fuses



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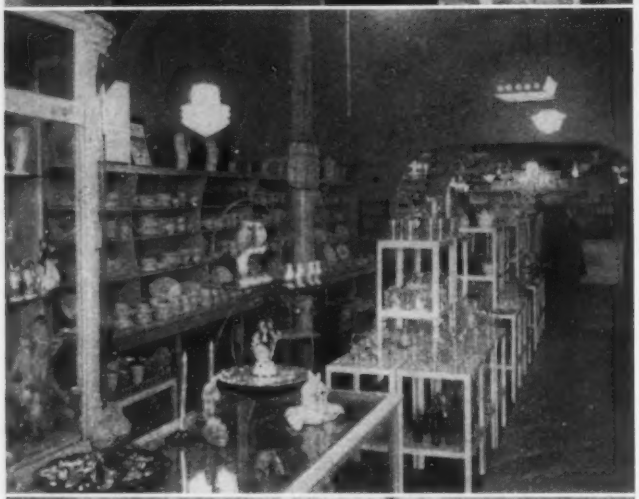

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Transition to Crockery

Salt Lake dealer began year ago replacing appliances with always-needed dishware

FRED WOLTERS is not the kind to let a war or anything else put him out of business. Possessed of optimism and initiative and with an accumulation of business experience of a lifetime, he looks far ahead and steers a course like a capable navigator. Now his electrical business may be at low ebb but his business is still navigating and bids fair to weather this as it has other storms in the past. His transition is an idea and an inspiration for other electrical dealers.

When the signs in the wind indicated appliances would be eliminated from civilian goods manufacture, Fred Wolters looked for something that was sure to be made, regardless. Dishes were the answer. They are always needed. They break. They must be replaced. They must be manufactured, regardless.

Possessed of an excellent store location, at 238 South State St., in Salt Lake City, with a small but compact store, Wolters began the retreat of the appliances to the rear of the store while he gradually built up his new line, crockery and giftware, in the front. The process was so gradual that customers scarcely noticed. Finally the lamp counter, which used to be up near the front, was moved to the extreme rear (Fig. 1). It becomes the wrapping, service and lamp counter.

Remaining electrical goods are in the alcove room at the rear of the store which used to be the fixture display room and still is for remaining fixtures. The service shop is back of the counter, and wiring supplies have gone downstairs in the basement.

The long display floor up front and the window are now devoted to dishes and crockery giftwares. Shelving that used to hold appliances and lamps is filled with attractive dishes and glassware. The entire store was repainted in light tints to make attractive display background for this merchandise.

One of the electrical supply houses had a surplus of the little steel stands, merchandised with electric roasters. Wolters bought all of them and used them for attractive and flexible display tables and racks (Fig. 2). A dining table, with lace tablecloth, is set attractively with dishes and placed in the center of the fixture display room at the rear. Wolters has found that this helps him sell crystal and other dining room fixtures as well as sets of dishes.

What to do with the still necessary stock of small electrical parts and fittings in this new atmosphere was solved by getting made a quantity of neat boxes to fit in shelves in this fixture room (Fig. 3). Labels on each box tell what is inside and this material is all readily available yet attractively covered. It is service merchandise these days, anyway, and the quantity available is insufficient to push it.

In the rear, out of sight, is the appliance repair bench (Fig. 4). The shop is neat. Appliances for repair are kept on shelves. The wiring department is small but it continues to take care of small jobs and maintenance for customers. Wolters has never been after the big contracts and says he is content to devote most of his time to making the new business of his converted store efficient and keep it known to the public for that time when appliances return.

He continues advertising, maintains the display with scrupulous neatness to enhance the type of merchandise it is, develops much repeat business that he feels will bring customers back often and to their mutual profit.

Points

Unrationed but nourishing bits picked up in sales

● ITS BEAUTIFUL SHOWROOM is now USO clubroom for the WAVES, SPARS, WACS and Women Marines but San Diego Standard Electric Co., Philco and ABC washer distributor for the San Diego County area, has compacted its business into what used to be part of the warehouse at the back and on a mezzanine and is carrying on as usual. Bob Harris, manager, has not attempted to take on other lines, feeling that the radio parts and tubes business and that of batteries and parts for refrigeration and washing machines will carry on. Considerable priority sales of Philco refrigerators have been made to Navy personnel in San Diego. The company has done a good year's business, cut its overhead and plans to be in a position to launch a strong program when new merchandise is available.

● THE ELECTRIC APPLIANCE HOSPITAL has opened one of San Francisco's largest appliance repair shops at 2311 Market St. William Barrell is proprietor. It was formerly located at 382 22nd St. A crew of eight service men repairs refrigerators, washing machines, radios, vacuum cleaners and sewing machines. It is authorized service dealer for Norge, Westinghouse, Leonard, Kelvinator, Sparton, Gibson and AMC equipment.

● THE THIRD WAR LOAN was given impetus by Hotpoint's "Bond Wagon Drive," which tied in not only the company's advertising in national magazines but offered dealers mats for local advertising in their home papers, stressing the buying of bonds for the purchase of electric kitchens after the war. In these advertisements the company's home planning file was offered for only 25 cents. Response to previous advertising of this kind and demands for the home planning file have been so numerous that the idea was redeployed to aid the Third War Loan campaign.

● BETTER CARE—LESS REPAIR will be the slogan of the national progam on appliance care and maintenance launched by the Edison Electric Institute appliance conservation committee beginning January 1944. Window and store displays, a check list of care on home appliances will be available for distribution.

● A MEDIUM for interchange of practical ideas is a new campaign advertised by Proctor Electric Co., of Philadelphia. It offers war bonds for "Tel-Anothers" which it defines as ideas that others can use. These ideas are to be used in the company's advertisements in the trade magazines as a means of disseminating helpful information to other dealers. For each one used a $25 War Bond is awarded.

● COUNTY FAIRS still carry on in many counties and Southern California Edison Co. merchandise department, under H. C. Rice, has taken advantage of the opportunity to display home dehydrators for vegetables and fruits. Circulars prepared by the advertising department were passed out among visitors and in many cases the dehydration products of the exhibit won awards at the fair. The company also obtained a film from *Good Housekeeping* magazine entitled *Canning the Victory Garden Produce*. This is receiving extensive showings in schools and women's meetings in southern California.

● BENDIX distributors held meetings with C. V. Calkins, vice-president, throughout the West during the month of September. Calkins brought an interpretation of Bendix postwar thinking and details of its consumer survey to determine the per cent of families planning to buy washers following the war. Meetings were held in Los Angeles, Sept. 9, and San Francisco Sept. 13, with the Leo J. Meyberg Co.; in Seattle with the Harper Meggee, Inc.; Billings, Northwestern Auto Supply Co.; Salt Lake City, the Flint Distributing Co., and in Denver, the Larson Distributing Co.

● CALIFORNIA ELECTRIC SERVICE STATIONS held open house for its new Los Angeles plant at 1518 West Seventh St., Sept. 3. Much larger quarters than those at 630 West Ninth St. provide ample space for the electric clock repair service on which the Los Angeles station specializes. It is managed by Keith L. Chamblin.

● CREATION of a "Better Homes Department" is announced by B. W. Clark, vice-president in charge of sales of Westinghouse Electric & Mfg. Co. It will be in charge of Irving W. Clark with headquarters in Pittsburgh. Its purpose is to provide an advisory and consultation service for architects, engineers, builders, prefabricators and home owners. It will cover such subjects as home lighting, wiring layouts, room coolers, electric controls, kitchen and laundry plans and the Precipitron.

● OMITTED from the list of authorized electrical appliance service stations in the 11 Western states printed in September were those of the Chicago Flexible Shaft Co. (Sunbeam appliances, Stewart Electric Clipmasters and Shearmasters). These service stations will be included in reprints of the directory to be distributed by the utilities of the West. They are:

Seattle: Howell's Electric & Supply Co., 522 Union St.
Spokane: Maxwell & Franks, 619 First Ave.
Tacoma: Ajax Electric Co., 746 Market Street.
Portland: W. L. May Co., 215 N. W. Park Ave.
Los Angeles: Chicago Flexible Shaft Co., 737 S. Hope St.
San Francisco: Will M. Aronson, 955 Folsom St.
Phoenix: Vinson-Carter Co., 25 E. Adams Street.
Denver: Midwest Electric Wiring Co., 323 W. Colfax St.
Salt Lake City: Chicago Flexible Shaft Co., 224 S. W. Temple St.

● *Community Action for Postwar Jobs & Profits* is a booklet which local business men, such as contractors, dealers or utility company managers and other business men, may use as a guide to develop jobs and profitable business after the war. It is designed to be used by local leadership of such organizations as chambers of commerce and business associations in planning work piles, manufacturing opportunities, handling of wartime populations, strengthening of business and distributive trades, service establishments and manufacturing, expanding trade areas, developing farm business. Along with it are civic planning, social and recreational opportunities. The second part of the book contains guide sheets which help each community to organize the information necessary on which to make its plans. Additional guide sheets are available upon request, as are copies of the book, from the U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce offices in Denver, Los Angeles, Portland, San Francisco and Seattle.

● DEHYDRATION equipment made of non-critical materials has appeared on the market, made by a number of appliance manufacturers. Dehydration has its literature too. L. C. Porter, in charge of rural lighting, ultra-violet and miniature lamps for the Lamp Department, General Electric Co., Nela Park, Cleveland, has prepared a comprehensive bibliography on the subject, listing the books, circulars, papers, articles and even pamphlets on the subject issued by universities, government departments, and by public utilities.

ELECTRICAL WEST

McGRAW-HILL COMPANY OF CALIFORNIA
68 POST ST. SAN FRANCISCO 4

The all-industry magazine of progress, established 1887 and incorporating the "Electrical Journal," "Journal of Electricity, Power & Gas" and "Journal of Electricity." Contents Copyrighted

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Regulatory Confiscation

IF allowed to stand, the order of the Utah State Public Service Commission in finding a $63,000,000 value for the properties of the Utah Power & Light Co., and ordering a $1,500.000 rate reduction, definitely establishes a New Order philosophy in utility regulation. "Original cost" will supplant "present fair value" as a basis for rate making.

Genesis of this new philosophy was foreseen in the last annual report of Electric Bond & Share Co. This commented that the "industry was built upon the economic and legal principle that utilities are entitled to earn a fair return upon the present fair value of the property devoted to the public service. For over forty years, this has been held the law of the land, since the Supreme Court decision in the case of Smyth versus Ames in 1898. Investments have been made on that sound, fundamental basis. The industry has grown to its present size and national importance on that basis."

In the Utah opinion original cost supplants fair present value and the doctrine of reproduction cost now is given no consideration whatever. The degree to which this new philosophy protects all of the parties subject to the benefits of regulation is questionable. Sound regulation purports to protect the interests of the customer, the investor, the employee and the public. Extension of the doctrine expressed in the Utah opinion will mean that the interest of some groups will be omitted. Protection may turn out to be confiscation.

Some More Irreconcilables

UNTIL final victory is won; until the last Jap soldier has been blasted from his warren; until the last Nazi gangster is hanging from a gibbet, America should be devoted to a single purpose: The mobilization and utilization of human energy and material resources to produce the greatest possible quantity of war materials, in the shortest possible time, by the most efficient use of equipment, and with the least waste of material and manpower. That doctrine should inspire and guide every one, from the highest to the lowest—politician and industrialist, business man and labor leader, soldier and worker, the butcher, the baker the candlestick maker; doctor, lawyer, merchant chief; all people in the electrical business from utility presidents to groundmen, from bosses to the greenest helper. Unless it does, victory is postponed, more fighting men die, time and material are wasted.

How then, can some of the obscure, devious and unfortunately, little publicized policies and practices be reconciled with such a paramount national need? Take the matter of production, conservation and utilization of critical metals, for instance. Aluminum pig piles up in reduction plants, yet because aluminum production and expansion of federal electric power facilities are so closely tied together, there is talk of building more aluminum capacity. Because silver production has been a political football in the Western mining states backed by a group known as the silver bloc, weird things have been done to keep silver mining alive and to maintain the price of that metal. One of these has been the use of huge quantities of the precious metal in place of copper. Justification of this is not questioned. But when millions of pounds of copper are replaced with silver and then the metal is allowed to lie for three, five or seven months in the yard of an industrial plant, as has happened here in the West, then certainly the best interests of the war effort are not being served. To let such huge quantities of critical copper lie unused is not only sabotage against war production but sinful as regards civilian requirements. The farmer whose crops dry up because no copper wire is available to hook his pumping plant to the distribution lines, won't understand the reasons for such misuse. Neither will the rural housewife who can't secure the wire for a service drop to her home.

Such situations arouse doubt as to the necessity for some of the policies invoked in the name of

war and quick victory. They arouse doubt as to the sincerity of the administrators who are responsible. Certainly they do not conform to singleness of purpose in winning the war quickly and with the least expenditure of materials and manpower.

Not Too Much Talk

A LOT of housewives are being led to believe that the minute the war ends the market will be flooded with war-born dream appliances that will revolutionize the kitchen and the laundry. This idea should be scotched before it works to the detriment of the industry. As a matter of fact, the first appliances to be available will be 1941 models. Furthermore, it will be many months before appliances will be on the market in quantities. Just recently a group of appliance people were canvassed to determine how quickly they could convert from war goods to their standard lines. The minimum period was three months and the maximum 15 months. This is not to be interpreted as a suggestion that postwar crystal gazing should stop. For the sake of progress, it should proceed as speedily as possible. The point is to keep quiet about it. Any good merchandiser knows that it is foolhardy to announce a new product before it can be delivered.

What the Customer Wants

MANY of the engineers and designers who are today working in the laboratories on the new appliances for the postwar world should read Arthur Hirose's article in the September issue of *Advertising & Selling*. For that matter so should the people who expect to sell them. Mr. Hirose, who for many years was on the staff of *Electrical Merchandising*, offers 115 specific suggestions for postwar product and home improvements. Coming from the editors of *McCall's* all of them reflect the customer viewpoint. They are things that the housewife wants.

Too many times in the past the electrical industry has tried to sell the housewife an appliance which some engineer thought was good for her, rather than something which Mrs. Housewife herself wanted. Usually the result has been disastrous and costly to the manufacturer and the retailer. This criticism should not be interpreted as reflecting discredit on the design and production engineers. It merely points out that too seldom have they considered the likes and requirements of the customer.

Some of Mr. Hirose's suggestions include pet peeves of ours. For instance: An easier way to remove a small number of cubes from an ice tray. A way to freeze good ice cream. No legs on ranges or refrigerators. An oven located so the housewife won't have to break her back or rip her stockings to look into it. Appliances with no cracks, corners or crevices where dirt will accumulate. Enough storage space in the kitchen. A good indoor method of drying clothes. Infinitely variable illumination intensities. A constant temperature shower spray, once it's adjusted. We repeat, the entire list has 115 items, all worth reading. And all are worthy of careful consideration in the design of postwar equipment and appliances.

Nearer Heart's Desire

VIRTUALLY all of the remaking of the world nearer to the heart's desire that is being done in the postwar planning days is similar. It envisages a perfect world and goes on from there. Even the National Electrical Code is viewed from the idealistic, rather than the realistic vision-point. This might really develop an ideal Code for the future, based on reason and engineering fact, or simplicity and ruggedness, depending on who does the dreaming, if it weren't for the reality that no two persons or groups dream the same ideal of perfection.

Since they do not dream alike, is it not likely that when it comes to revising the 1940 Code to after-war conditions, the same struggles and resulting compromises will prevail which make the Code a democratically developed set of rules, not completely satisfying to any zealot, but a fair working arrangement?

WE won the first world war but lost the fitful peace that followed. We all have the solemn obligation to see to it this time that our children inherit the kind of America their fathers fought and died for. Not an ersatz *America polluted by the very tyranny over which we have scored a victory, but an America faithful to its own unique way of life. An America suited for free men, not robots. An America which rejects the bogus equality enforced from above by some super-state; but cherishes the true equality that derives from equal opportunity. An America that seeks diligently to remove unfair handicaps and protects those who fall by the wayside; but does not call off the race. An America that refuses to yield to the totalitarian contagions of this epoch; but adheres resolutely to its faith in the individual and its preference for high striving and full-blooded adventure.*—Eric A. Johnston, president, Chamber of Commerce of the United States.

Civilian Wire

Regulation changes in materials, systems, prices, manpower

COPPER wire for civilian use in minor repairs is again available in limited quantities under CMP-9, issued Sept. 10 by the War Production Board. A retailer, radio or appliance repair man, electrician or hardware store that sells to the general public may buy up to $100 worth of copper wire for resale to the public during any calendar quarter, subject to certification and restrictions.

Such wire is not to be used in construction, in major repairs or may not be sold to anyone who is covered by CMP-1, such as motor shops, L-41 in construction, CMP-5 for major building and industrial maintenance and repairs or other orders. The only preference rating a retailer is to recognize for the sale of such wire is an AAA or a farmer's certificate under PR-19. The general public requires no ratings.

● SECONDARY ELECTRICAL DISTRIBUTION EQUIPMENT, such as safety switches, circuit breaker panels, service entrance equipment, panel and distribution boards and knife switches, however, were given another squeeze on use of steel, copper and brass under L-315, Sept. 26. Up to Dec. 15 orders for such equipment may be filled if rated AA-5 or better, but after that these material restrictions are effective on all manufacture except for the armed services. Restrictions include: 1. Reduced gage of steel enclosing cases. 2. No doors for dead front panelboards. 3. No copper or brass in neutral terminal bus of 70 amp. or smaller. 4. No galvanized steel for enclosures.

● NON-INDUSTRIAL FLUORESCENT lighting fixtures for offices and drafting rooms can be made again after Dec. 1, according to an amendment to L-78. Inventories by then of previously made fixtures will have been exhausted. New manufacture must be subject to new curtailments of allowable metal. The order prohibits some types of industrial fixtures and has certain restrictions on deliveries from inventory.

● REDISTRIBUTION of a large volume of used or idle machinery or equipment, much of it owned by the government, is being planned by WPB through its Redistribution Division. Inventories of such equipment are being taken both from private owners and government agencies and this division will act as a brokerage-without-fee agency to help negotiate for the placing of such equipment in use, under OPA regulations.

● REVISED PRICING in the sale of second-hand machines and parts and second-hand machine tools acquired for rental purposes by the War and Navy Departments, was announced by OPA, in an amendment to MPR-136 (Machines and Parts and Machinery Services), Sept. 30. The same basis used by Defense Plant Corp. is prescribed.

● L-41, the construction order, now has a much simplified material list. A new, single page form takes the place of the former form in applications for conversion and private housing.

● PAPERWORK is to be eliminated and considerable time saved by decision of Office of War Utilities to trust the utilities to use their own brains and judgment in the processing of a number of extensions, services and temporary service connections. A new order, U-l-f, permits utilities to grant extensions, under specified conditions, without filing with Washington. This alone will eliminate the processing of 8,000 to 10,000 applications a month. U-l-g is another such order covering temporary service connections. Other minor refinements in the U-1 orders were also made.

● FARMERS are extended until Dec. 1 the exemption to L-123 which requires an A-1-c or better for delivery of general industrial equipment, including switches, circuit breakers and small motors.

● A QUOTA SYSTEM is being worked out by OWU to keep track of transformers, the excess stocks of 1½- to 10-kva. having been so depleted by REA that a new system is necessary. A fixed number of transformers will be available for U-1-c extensions each month; when the quota has been used up, no further applications will be processed. Nearly all applications so far have required a transformer.

● RETAILER'S BULLETIN No. 37 issued by OPA presents simple instructions for classification of used washing machines. It is illustrated with diagrams indicating what it means by its terms in referring to parts of a washer. Thus the schedule of ceiling prices on its last page has definite meaning.

● SIMILARLY BULLETIN No. 46 of OPA sets down simply and understandably its rules for pricing of assembled radio sets. Both are great improvements over the legal language in minute type of the original order.

● MANPOWER DIRECTIVES threw the West into considerable confusion during the month. In an effort to squeeze more manpower out of everything else so that it would gravitate toward the aircraft and shipbuilding industries, there were cancellations of subcontracts for fittings and supplies, and threats of more. No contract was to be placed in the West Coast region which would require an increase of manpower. At the close of the month the situation was clearing somewhat but still muddy.

● MEANWHILE wider subcontracting of critical electronic test equipment and instruments was being sought by WPB's radio and radar division. Regional offices were set on a hunt for manufacturing facilities to take on such work.

● GOVERNMENT V-LOANS to help subcontractors finance such contracts were made available on a broader basis, to assure contractors that their working capital invested in war production would not be frozen in the event of contract terminations.

● SMALL BUSINESS was also offered the aid of the Department of Justice in untangling itself from legal and administrative complexities of wartime economy if it was seeking to participate in the war program.

● A TECHNICAL ADVISORY SERVICE, set up by regions, was also established to give small business concerns the technical help that large companies derive from research and engineering staffs. This is under Smaller War Plants Corp.

● WHOLESALERS IN LOS ANGELES AND SAN DIEGO, through the efforts of the Biddle Trade Bureau, have obtained a "declaration of essentiality of electrical supplies and equipment" from the deputy regional director of the War Manpower Commission for southern California. Under this declaration employees are told not to change their employment and the United States Employment Service was instructed to recruit and supply employees as for other essential industries.

● DRAFT OF FATHERS changed the emphasis from dependency to essentiality in the listing of critical occupations subject to deferment. In this list are electrical engineers, electric testers, electricians—all around. foremen and other listings. While local draft board still have the decision in each case, this critical list enables the employer to present a case for the deferment of key personnel and to make appeals from local board decisions.

Section officers W. R. Volheye, president; J. H. Stayner, president elect; F. D. Weber, secretary; R. J. Larrabee, chairman of the Puget Sound Chapter, of Underwriters

Inspectors Cogitate

Northwest Section annual meeting, Seattle, delves into war and postwar Code affairs

CHARACTERIZING the National Electrical Code as a "commercial and personal compromise bolstered by the empiricism of the inspectors" S. B. Williams, editor of *Electrical World*, entered a plea that code revisions after the war be based on fact rather than argument and on standards scientifically determined rather than loosely gathered experiences. Williams' plea was voiced in one of the more thought-provoking papers presented at the Seventeenth annual meeting, Northwestern Section, IAEI, in Seattle, Aug. 26 and 27. The burden of his argument was that the Code was at present more than a minimum standard, and specified materials and methods beyond the requirements of reasonableness; that the "unity of safety" be based on known facts, and that a more scientific sampling of field experience be used in determining the factors of safety to apply to this unity to arrive at Code specifications. Williams' paper was read by Henry W. Young of Portland.

Chief champion of the Code as it is and as it has evolved over a period of some 50 years was Victor H. Tousley, secretary, IAEI, who pointed out the difficulties of drawing a hard and fast line of "unity of safety" and who characterized the Code as a compromise of judgments and experience rather than a compromise of commercial interests.

The meeting, which packed an extensive program into two solid days including one night session and one Code breakfast, drew 120 delegates from the inspection fraternity in the Pacific Northwest. W. R. Volheye, chief state electrical inspector for Oregon, president during the past year, presided, while R. A. Walker, Puget Sound Power & Light Co. and secretary of the Electric Club of Washington, the sponsoring organization, acted as general convention chairman. At the closing session, J. Hyde Stayner, Utah Power & Light Co., was elected president to succeed Volheye for the coming year.

Postwar problems should be the first consideration of the association, said T. W. Bowry, International president from Richmond, Va., in his presidential address. Some of these problems which the association now should begin to sink its teeth into are: Should the IAEI take a positive stand for or against sales control; should we have universal inspection laws; what should be done about the accumulation of uninspected work during the war emergency; why the inspector is interested in the increased use of electricity; should we adopt, as a requirement for licensing, standard examinations for contractors and wiremen; what to do about wiring owned and operated government agencies, without inspection.

The report of the Public Relations committee by Capt. Stephen E. Sanislo, Seattle fire department, emphasized the fine work done in the past year by the electric utilities, both private and public, in the territory, in educating the public on the safe use of electricity and the conservation of their appliances that cannot be replaced for the duration. In the report of fires and accidents caused by electricity, also by Captain Sanislo, an improvement was noted over the previous year in the number and severity of fires. Captain Sanislo appeared a third time on the program in a stirring reminder of the continued necessity for thorough organization of civilian defense throughout the territory.

Pointing out that much of the wartime activity of Underwriters' Laboratories had to do with investigating emergency alternatives to conserve critical materials in line with WPB regulations, Herbert G. Ufer, of the Underwriters' Laboratories, Los Angeles, outlined the orderly procedure under which alternate materials were recognized, as follows: (1) recognition of substitutes to be on the basis of an emergency alternative, recognition to cease when the emergency is past; (2) recognize whatever substitutes are formally announced as emergency alternatives in the Federal specifications, thereby avoiding duplication of industry consultation; (3) be certain that the Federal Specifications Board and its priority contacts agree as to the existence and extent of an emergency before announcing amendments to our standards.

Concluding an excellent paper on the characteristics of and developments in a-c welding, Verne B. Wilfley, Westinghouse E & M, Seattle, put in a plea that the next Code revision include a coverage of a-c and d-c arc welders and resistance welding, and commended the report of the special technical committee appointed by the Electrical committee on this subject, which has proposed a new Article No. 630 to cover it. Some revisions of the proposed article were suggested. Developments in d-c welding were outlined by J. R. Morrill, Lincoln Electric Co.

A report on the status of synthetic rubber production by E. S. McConnell, U. S. Rubber Co., was optimistic. It stated that the first two-year objective outlined for synthetic manufacture probably would be reached. Although natural rubber is initially superior to synthetic in most performance characteristics, synthetics are superior in resistance to most influences that cause deterioration. We will be able to continue to make wires and cables which will give satisfactory performance and which will permit inspection bureaus to maintain the standards of safety to which the public has become accustomed, McConnell said.

Companion papers on bus structures and power feeder systems were presented by Harold M. Hudson, ITE Circuit Breaker Co. and T. M. Widrig, Trumbull Electric Mfg Co., respectively. Hudson reviewed an exhaustive treatise on the subject of buses and bus structures by William Deans, chief engineer of his company, and Widrig followed with a discussion of enclosed bus bar feeder distribution systems for industrial loads.

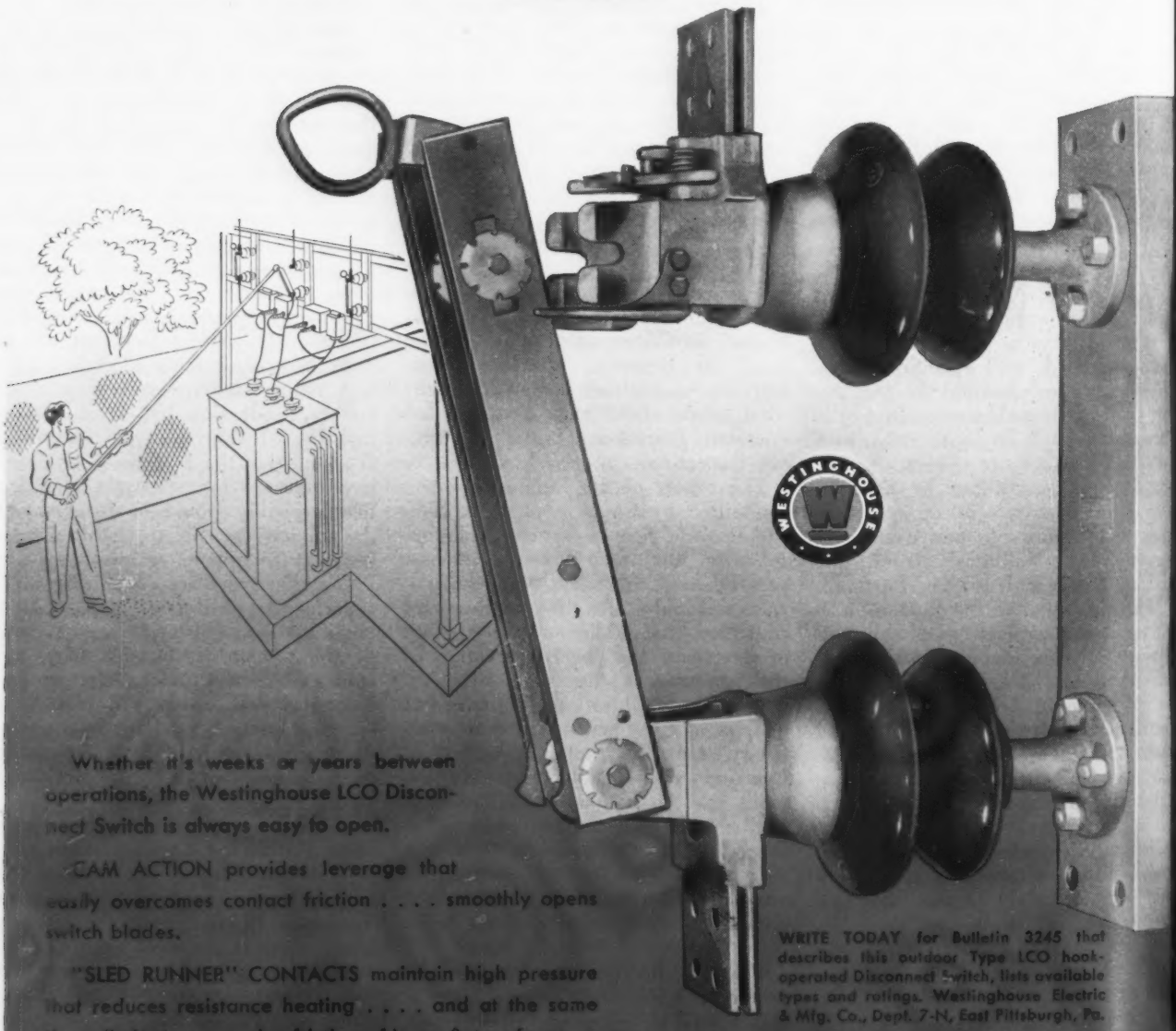
In a night session given over to lighting, Walter E. Potter, lamp department of General Electric Co., displayed and explained a number of new

THE WESTINGHOUSE LCO OUTDOOR DISCONNECT SWITCH

always

Easy to open

...yet locked when shut



Whether it's weeks or years between operations, the Westinghouse LCO Disconnect Switch is always easy to open.

CAM ACTION provides leverage that easily overcomes contact friction . . . . smoothly opens switch blades.

"SLED RUNNER" CONTACTS maintain high pressure that reduces resistance heating . . . . and at the same time eliminates excessive friction of large flat surfaces.

When closed, a latch securely locks the blades . . . . prevents accidental opening even under severest short circuit conditions. A slight pull on the hook-eye quickly releases the latch.

J-60540

WRITE TODAY for Bulletin 3245 that describes this outdoor Type LCO hook-operated Disconnect Switch, lists available types and ratings. Westinghouse Electric & Mfg. Co., Dept. 7-N, East Pittsburgh, Pa.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

DISCONNECT SWITCHES

AEI national officers — Tom Bowry, Richmond, Va., president; Victor H. Tousley, Chicago, secretary-treasurer

ight sources being applied to war uses nd for postwar civilian application. large postwar field for cold cathode ghting after the war when restric- ons were lifted was prophesied by eon F. Moore, Electrical Products onsolidated, in a paper outlining re- nt developments in this field.

Concern was expressed by the group at the mandatory provisions for the ype S fuse in the 1940 Code might ot be replaced after the emergency. . L. Gaffney reported on the action the Emergency committee of the lectrical committee in deferring the ates for making this fuse mandatory. a recommendation from the board directors of the NFPA. The meet- g passed a resolution urging the lectrical committee to reinstate these andatory dates.

One major revision of the Code was eported on, namely a re-writing of rticle 500 to define and classify haz- rdous locations into three degrees of azards: extreme, severe and moder- e. The rules of the Article were then vised to specify the types of instal- tions allowable in each classifica- on. The report was prepared by A. Snow and E. B. Morrison of the regon Insurance Rating Bureau, and resented to the meeting and to the orthwestern Section's committee on rticle 500 simultaneously. The report as approved as a progress report to

. M. Kirsop, Olympia, past presi- ent, who presided at Code Breakfast

be submitted to the Executive Council of the IAEI.

Two general discussions were held on the Code and inspection problems. The Code breakfast, with Chester M. Kirsop, chief electrical inspector, Olympia, as chairman, took up fusing troubles and the wire situation, with the multiplicity of wires and new insulation materials. Principal discussion centered around the use of weatherproof and cambric insulated neutral. At another point in the meeting an open forum, conducted by L. W. Going, chief electrical inspector, Portland, aided by a panel of some of the active inspectors present, answered 31 questions on interpretation of emergency amendments that had been raised in the field.

The report of the Legislative committee by F. H. Murphy, Portland General Electric Co., advocated passage of sales control ordinances in cities, or state laws, in jurisdictions not now regulating appliances and materials offered for sale. It is feared that after the war the market may be flooded with inferior appliances. As a supplement to this report, I. B. Sturges, electrical inspector, Portland, reported on the present-day enforcement of Portland's 21-year-old sales control law, noting an increase in inferior and non-approved devices on the Portland market since the wartime control of critical materials.

Internal affairs in the Northwestern Section were shown to be in a healthy condition. The reports of F. D. Weber, Oregon Insurance Rating Bureau, secretary-treasurer, and O. A. Alderman, Bussman Mfg. Co., chairman of the membership committee, showed that new members had just about balanced the losses made inevitable by the war. Reports by the three chapters, John R. Crawford for Montana, C. F. Grant for Utah, and R. J. Larrabee for Puget Sound, told of excellent chapter meetings held in the spring of the year. New bylaws for the section with a few desirable revisions were presented by A. M. McLean, Portland, and adopted.

To function with the new president, J. Hyde Stayner, the following officers were elected: First vice-president, Harry Hilpert, IBEW, Seattle; second vice-president H. E. Chambliss, Montana Power Co., Great Falls; secretary-treasurer, F. D. Weber. Weber will again represent the section on the Electrical committee with L. W. Going as alternate. He also was elected as the section's representative on the Executive Council.

Chester M. Kirsop of Olympia, Wash., presented that city's invitation to the section to hold its 1944 meeting there.

Southwest Section

Wartime methods and new developments appraised

NOT the Code, interimmed to its lowest common denominator these war days of material shortages, but inspection and the Code in the tomorrow after the war, engaged the close attention and interest of the Southwest Section, International Association of Electrical Inspectors, at its 20th annual meeting, Los Angeles, Aug. 30-Sept. 1. Only the inconsistency of the *Machine Tool Article 670* of the National Electrical Code was questioned in the meetings, freest of discussion of any for several years. Instead the 190 men and women, with a large majority of them active electrical inspectors, plunged into consideration of what their job would be like after the war. They also listened intently to descriptions of new equipment and absorbed new data which has been derived from war production plant innovations recently.

IAEI President Tom W. Bowry, electrical inspector of Richmond, Va.; Victor H. Tousley, IAEI secretary-treasurer and field engineer of National Fire Protection Assn., Chicago, were the two international officers present. Oscar D. Butterfield, electrical inspector, Torrance, Calif., president of the section, presided. Each of them discussed the place of the inspector after the war.

Planning

In his presidential address Bowry told of the appointment of an IAEI postwar planning committee and enumerated a number of subjects it should study. Predicting a boom after the war he said, "There may be an evolution in our whole wiring practice. Some of the substitute materials which are being used for the duration may prove to be better than those originally required. Work for which permits have been issued for the duration, in some cases, if no trouble develops, will never be dismantled, and in some localities, regardless of how much trouble develops, these substitute materials will never be removed."

Section President Butterfield spoke of it from another angle, that of the type of inspector required in the past, today and tomorrow. Today's inspector, he said, "must be very careful about granting permission to substitute materials because there are those who are taking advantage of the fact that we are in a war in order to use non-labeled equipment and material, and sometimes materials that are defective and unfit for use under any cir-

New officers, Southwest Section — Harold Gerber, San Francisco, secretary; M. C. Sandles, Oakland, second vice-president; E. E. Larson, Riverside, vice-president and N. J. Siggins, San Francisco, president. At right, Frank Short, general meeting chairman; O. D. Butterfield, Torrance, president; T. W. Bowry, V. H. Tousley, and H. L. Gerber

cumstances." He also told how an inspector on subsequent visits to an industrial plant which started out with a fine electrical system often finds machinery moved, new machines added and all of them running on the same feeders and sub-feeders that were designed for the original installation.

Put in the form of a series of questions on which the postwar planning committee would like the advice and guidance of active inspectors to assist it in the formulation of a suggested program for inspectors everywhere, W. A. Cyr, associate editor of ELECTRICAL WEST, and member of the IAEI postwar planning committee, covered the sweep of the subject rather exhaustively. He posed the fundamental questions of standardization and simplification versus free competition of all wiring systems, reinspection, conversion of war plant back to civilian use, who would make the conversion, how much used wire and equipment would be used.

He asked what disposition was to be made of surplus war stocks, the salvaged materials from camp demolition, the overstock of cheapened and substituted devices—iron for copper. Even the possibility of raw material scarcities continuing, the development of aluminum interior wiring conductors were put out as possibilities. New devices and appliances, high frequency devices presenting invisible hazards, lighting employing higher voltages, all present postwar questions. The fate of the war housing, the competence of postwar electricians and the educational job to be done were also set forth for study. Finally he posed a few of the many questions which may have to be answered in the rewriting of the Code after the war.

"Certainly the job of an inspector has no chance to grow dull and monotonous in the years ahead, he concluded, asking inspectors to send their opinions for the committee's guidance.

Another who touched upon after war adjustment was Joseph J. Siddall, electrical engineer, H. H. Robertson Co., Pittsburgh, Pa. In a spritely talk, followed by showing of pictures of early wiring practices, Siddall told of the effort being made to develop a uniform building code for approval of the American Standards Assn. He advocated support of such a movement which would bring the nation a national building code. He stressed the necessity for closer coordination between the building and electrical departments of each city, with the fire department also included.

In designing the program Harold L. Gerber, secretary-treasurer and program chairman, had assigned topics to qualified speakers with a view to bringing to inspectors some of the new and sometimes perplexing developments of the times in order that they might better handle inspection in connection with them. Among these were industrial x-rays, new insulations on conductors, critical materials in housing, bus bar capacities, war production wiring installations, electronic motor controls, new type-S fuses without lag features, Underwriters' standards for emergency installations, and up-rating plant distribution systems.

War Production Wiring

Larry Trim, electrical inspector, Burbank, filled the noon luncheon talk gap, left by the inability of a prominent army officer to come, by presenting his talk on *War Production Wiring*. He told of spray painting booths big enough to take four-motored bombers and the lighting for them kept in troffers under air pressure to prevent volatile gases from entering the enclosures. He described protection for workers near million-volt x-ray machines. Transformer vault location to provide both nearness to loads and protection from either bomb fragments or fire hazard, he also discussed.

That literally thousands of small plants, one- and two-man shops act as material feeders to large plants and in them are found the offenders and violators of Code requirements, Trim went on to say. The wiring conditions found in them are often greater hazards than hand grenades would be. "The more voltage drop they button on to their systems, the more outages, chattering of tools, gouges, burned up motors, accidents and delays occur," Trim said.

Reassuring was the talk given by Howard Dodge, senior engineer, Underwriters' Laboratories, Inc., San Francisco, *Underwriters' Laboratories Standards for Emergency Installations*, prefaced by this statement, "In our consideration of any emergency requirement the fundamental laws governing the safe use of electrical equipment cannot be ignored. To ignore them in the acceptance of substitute materials might result in the loss of more material than we are striving desperately to save." Dodge then went into detail as to causes for electrical fires. He then reviewed some of the substitutions suggested and the reasons they could not be accepted. Others accepted he told under what limitations.

Leaving these general considerations Dodge went into detail on one of the 80 emergency requirements—that of fluorescent fixtures utilizing non-metallic enclosures. This he illustrated as he talked by dismantling sample fixtures before the audience and pointing out the application of the requirements. He concluded with the statement that if proper materials are not available to construct certain electrical equipment without violating fundamental principles of safety, it may be better not to build it at all.

Bus Bar Capacities

Extensive use being made of busways and bus bar distribution in war production plants made it necessary for inspectors to realize that capacities of such buses were limited under certain conditions of size and arrangement, said Gerber in introducing A. G. Van Norman, electrical engineer, Trumbull Electric Co., Los Angeles, who gave a paper on the subject. In it Van Norman told how, by close spacing of multiple buses sometimes the addition of a bus bar increased its

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carrying capacity so little that it was of no value. He discussed various alternating current effects and the difference these made in carrying capacity as compared to direct-current. (This paper will be published in ELECTRICAL WEST.)

Up-rating Plant Distribution Systems, was the topic presented by W. R. L'Hommedieu, Westinghouse Electric & Mfg., Los Angeles. He presented the factory network system as ideal in the conservation of copper and in flexibility. First he showed how the conventional radial system can be converted to a partial network as a unit of plant expansion, by moving transformers nearer to load centers. A banked secondary system, although not a network, has further advantages. Then he told of the advantages of a full network system, ending with the statement, "It would be an extreme case that would allow an existing electrical system to be converted to a simple network, so we cannot expect to use it in up-rating existing systems, but we expect to see this system installed at the beginning for many new plants."

One of the new recent developments, *Electronic Motor Controls*, was described in an illustrated talk by L. E. Donahue, General Electric Co., Los Angeles. He covered various electronic control devices, from photo cells to speed control of alternating current motors. Likewise he showed how developments and simplification of design have brought reductions in the cost of such equipment within the past few years.

E. S. McConnell, United States Rubber Co., New York City, gave the same paper he had given at the Northwest Section the week previously, *Emergency Alternate Specifications and Trends in Conductor Insulations*. In it he discussed the various synthetic rubbers and their characteristics. Later in the meeting the announcement was made that WPB had ruled that no more real rubber could be used for insulation of conductors.

Industrial X-Ray Installations, by E. Dale Trout, of General Electric X-Ray Corp., Chicago, was read by William Cox of the same company, Los Angeles. Illustrated by lantern slides it reviewed the history of the use of x-rays for industrial purposes, chiefly inspection of materials, from early days to date. Improvements in conductor insulations, transformer design, tube design and other refinements have permitted the safe increase in size of such devices until the million-volt machine of the aircraft industry of today has resulted.

Although type-S fuses without a time-lag feature are now available if anyone wants to buy them, James S. Mahan, Chicago, told the group in an address on the subject, anyone who knows would prefer those with the time-lag. He told why. Loaded circuits, especially with motor loads, which introduce heavy starting currents, in the homes of today cause blowing of ordinary fuses and invite tampering and penny-behind-the-fuse expedients by the public which increase fire hazards. He urged a return to the mandatory requirement for the use of type-S fuses, especially needed in wartime.

Relabeled an *Unsafe Appliance Ordinance*, the standard uniform ordinance, for the restriction of the sale of sub-standard or unsafe appliances, M. G. Sues, vice-president, Leo J. Meyberg Co., Los Angeles, representing the Pacific Coast Electrical Assn., told the meeting, should be adopted by every city in the West. Emphasizing that "this is not a high board fence proposal made in the interests of any manufacturer, individual or specific group. It is *not* an ordinance regulating the quality, the price, the type or design of any apparatus or equipment. It is an ordinance to prevent the sale of any radio or appliance that is hazardous or unsafe and that is all that it is," he told how it has been freed from legal "bugs" in its present form and was being supported by the League of Cities. His advice was that this was the time to have such an ordinance passed in all cities not yet having it to protect against a flood of unsafe appliances which may come with the end of war.

George D. Riddle, chief architect, Los Angeles office of FHA, spoke Monday afternoon upon the critical material situation. He reviewed the successive curtailments of such materials and the present policy under CMP. Ending his talk he asked inspectors to help in the conservation of wire by assisting those building under FHA permits to locate outlets and switches so as to reduce wire runs. In the postwar period he asked that there be more uniformity of requirements in all towns and asked that inspectors urge contractors to sell wiring additions to bring houses built now up to greater adequacy. Wiring now, he declared, even under materials restrictions, is better than the wiring in many older sections of some cities.

Code Discussion Brief

Code discussion was brief, though spirited enough. It flared up on *Article 670, Machine Tools*, when Gerber criticized the code makers for lowering the requirements for the wiring of motors integral with machine tools and limiting such exemptions to metal cutting tools. The inconsistency of this causes inspectors trouble when other types of machine tools are required to conform to previous standards. He was answered by Tousley that other types would be covered later; that in metal machine tools the wiring was enclosed in metal and if it did burn would not start a fire elsewhere.

Definition of what is "defense housing" in order to decide whether type EI wire may be used, was also asked, since some cities hold that it applies only to housing designed to be torn down after the war; others permit it on privately financed housing that is purchased and intended for long occupancy.

Others asked that it be required that steel bus bar, copper coated, be identified as steel wherever used, so that future inspectors would not permit its loading to copper capacities on a basis of its size.

Between the two reports on electrical fires and accidents, Monday, a strong plea was made to have hospital operating rooms classed as hazardous locations and required to be wired and equipped only with explosion-proof fittings and devices. Fatal accidents in which anaesthetic gases have exploded in patient's lungs, ignited by electric discharge, were described. The greatest danger, it was said, comes from sparks discharging static charges the doctors and nurses build up in their bodies and that the American Medical Assn. is working on the problem, seeking to require wearing of apparel and shoes that conduct the electrostatic charge away on conductive types of floors and thus eliminate this hazard.

Electrical fires reported from a lesser number of cities this year, said H. V. Dobson, electrical inspector, Santa Barbara, showed a larger percentage from electrical causes, 11% in all, although 41% of those were from electric refrigerator motors, 9.8% from improper use of appliances and only 7% from wiring.

Industrial accidents, reported George E. Kimball, supervising engineer, California Industrial Accident Commission, increased in the low-voltage classification, and in the contacting of overhead high-voltage lines, but declined in high voltage circuits and equipment. Fatalities, too, increased from 32 in 1941 and 1942 to 38 in 1943. However in proportion to the number employed in industry the percentage decreased.

Victor Tousley, reporting as IAEI secretary, told that membership had held up despite war; permits were down to an all-time low. There will be no revision of the National Electrical Code until war is over, the emergency committee acting on any necessary

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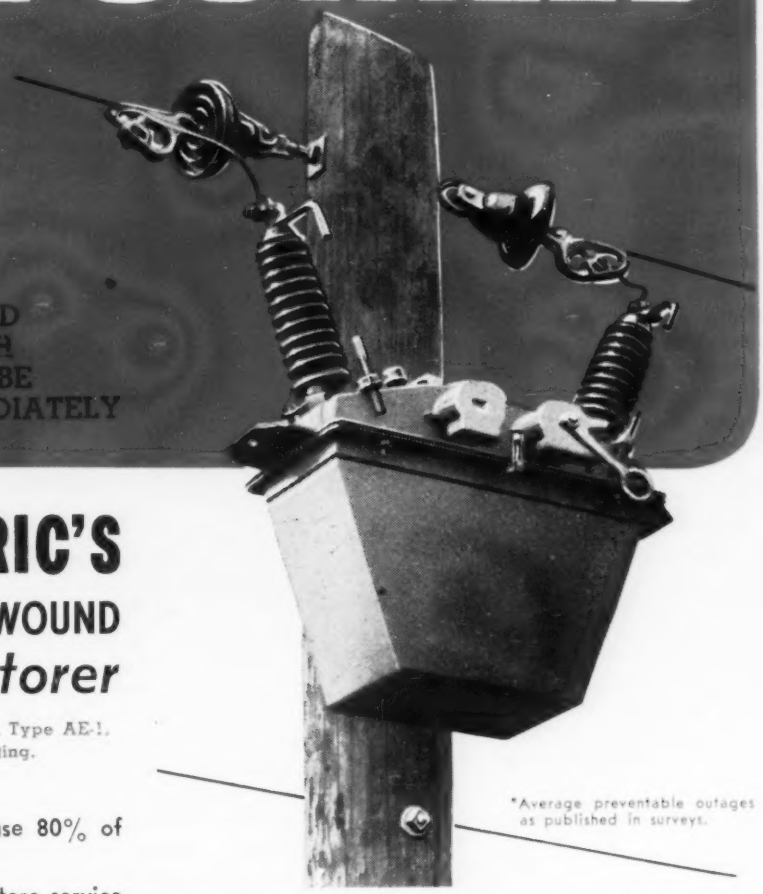

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LOWER MAINTENANCE—permits high-quality protection of low-cost systems

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changes. That the emergency committee had not been required to meet since early in the year, he felt, indicated that most of the retreat in standards had taken place. New subjects which will require codifying are infrared drying, grounding—if higher voltages are to be used, and welding. Oct. 15, he announced is the last day for receipt of comments from field experience to correct the first draft of the welding rules recently issued.

Even the two Code Breakfasts, Tuesday and Wednesday mornings, left the Code to discuss other subjects. On Tuesday, under W. J. Tretheway, chairman, H. C. Rice, merchandise manager, Southern California Edison Co., presented a wiring idea for ranges and water heaters which he asked the inspectors to approve. (An article on it will appear next issue.) Also discussed was the plan to hold educational clinics for inspectors in which to study some of the postwar problems. On the Wednesday morning breakfast, under chairman O. K. Jones, chief inspector, Los Angeles, the various substitute wires and cables now on the market were examined and discussed.

At the opening business session the inspectors were welcomed by A. D. Brown, Allis-Chalmers Co., past president of the Los Angeles Electric Club, who paid tribute to the electrical men and their constructive influence. R. H. Manahan, retired as chief of Los Angeles electrical division, responded, regretting the inability of his old verbal adversary, Ralph Wiley, chief, department of electricity, San Francisco, to attend. Honor was paid also to two prominent members who had died since the last meeting, Carl Heise, and Walter Brothers, of Berkeley.

In the election of officers for the new year, vice-president N. J. Siggins, San Francisco inspector, was elected president; E. E. Larson, electrical inspector, Riverside, was elected first vice-president and M. C. Sandles, chief inspector, Oakland, second vice-president. Harold Gerber was re-elected secretary-treasurer. Jarad A. Hill, Pacific Gas and Electric Co., San Francisco, was elected Class B member of the executive committee to fill the vacancy made by the death of Carl Heise. O. D. Butterfield succeeded James I. Dixon of Santa Clara. Otis Newcomb, Long Beach, and Clifford Prud'homme, Sacramento, remain on the committee. R. A. Manahan, retired, was re-elected to the Executive Council, IAEI and also as the section's representative on the Electrical Committee, with Ben Hill, superintendent, Oakland, as alternate. The latter is third vice-president of IAEI. Selection of the next meeting place was left in the hands of a committee headed by Hill. It will be held some where in northern California.

High praise was paid to Frank Short, Industrial Accident Commission, Los Angeles, who was general chairman of the meeting arrangements, to Mrs. H. G. Ufer, who headed the ladies' and social activities, to J. G. Moyen, Square D. Co., for exhibits and entertainment, H. C. Rice for transportation, Mrs. and Mr. Arthur C. Veit for the banquet and dance and Clem Purviance, Okonite Co., for golf. The Southern California Chapter provided all registered with a buffet luncheon on Wednesday noon. The ladies were given a luncheon by Underwriters' Laboratories on Tuesday and the entertainment feature, Monday night, was a visit to Columbia Broadcasting Studio in Hollywood.

Enlists in Conservation

RMEL annual meeting strengthens wartime program as clearinghouse for war activities

The Rocky Mountain Electrical League's "annual convention," for the second year, took the form of a business conference in Denver, Sept. 13-14. Electric utilities executives from Colorado, Wyoming, New Mexico, Utah, South Dakota, Kansas and Texas participated. Thomas P. Walker, Washington, D.C., president of the Council of Electric Operating Companies, was the featured speaker; he brought to the meeting a report from the seat of government concerning WPB's expectations from the electrical industry—particularly on the fuel, manpower and transportation conservation phases.

Two days of discussion, interrupted only by an all-industry luncheon on the first day, resulted in a resolution: "—that whereas WPB, through PAW, SFA, ODT and OWU has requested the Electric Utilities Industry, along with telephone, gas, water, coal, oil and transportation companies, to enter into a voluntary program for the conservation of fuel, transportation, manpower, materials and equipment vital to the war effort, the Rocky Mountain Electrical League recommends to its membership that each and every company affiliated with the league cooperate wholeheartedly in the program and give it full and complete support. The league will gather together programs worked out by member companies and others, and will distribute details covering these programs to the membership so as to be of assistance to each member in working out a program for his territory."

Publicity, consisting of prepared advertising copy, ready for release in the territory served by the various companies, was submitted for the benefit of those whose plans had not yet been reduced to definite form: Emphasis was placed on the fact that no power shortage exists anywhere in the Rocky Mountain region; that, while companies should urge customers (especially commercials) to reduce power usage wherever possible, conservation should not jeopardize public safety, eyesight, police or military efficiency.

George E. Lewis, RMEL manager, summarized accomplishments of the league for the past year, pointing out that many wartime policies now being pursued by the electrical utilities originated at league conferences; citing also that no less than a dozen governmental and semi-governmental agencies regularly look to RMEL for assistance and cooperation; that the league is a clearinghouse for exchange and sale of surplus critical materials, participates in practically all current war activities such as bond sales, collection of waste fats, tin, combat knives, copper, brass, steel and iron scrap, silk and nylon stockings, rubber, worn furs, human hair, etc. His recommendation that the league's treasury surplus be invested in War Bonds was adopted as further evidence of RMEL's all-out collaboration in the war effort.

The meeting marked conclusion of Gaylord B. Buck's second term as president of the league (1941, and again in 1943, an unprecedented honor). His able leadership was recognized by the gift of a wrist watch.

New officers named by conferees are: C. C. Baker, manager of the Colorado Central Power Co., Golden, Colo., president; Thomas W. Hughes, Sheridan County Electric Co., Sheridan, Wyo., L. A. Storey, Home Gas & Electric Co., Greeley, Colo., E. T. Tengin, Inland Utilities Co., Espanola, New Mexico, and L. A. Goalby, Westinghouse Electric and Mfg. Co., Denver, vice-presidents; W. C. Sterne and Harry Adler, Arvada Electric Co., Arvada, Colo., treasurer and assistant treasurer, respectively.

George Lewis was re-elected secretary and general manager.

● ROGER WALKER reported the recent annual meeting of the Northwest Section IAEI to members of the Seattle Electric Club on Sept. 13.

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PCEA Panorama — Edited by Mary Shoop

Who Am I?

I was born in Stacyville, Maine, on March 18, 1897. After early education at Cherryfield, I entered the University of Maine in 1915. I enlisted in the U. S. Naval Reserve Feb. 25, 1918, and was on active duty from Oct. 2, 1918, to Dec. 12, 1918. I was graduated from the university in 1919 with a B.S. degree in electrical engineering. Following graduation I joined the statistical department of Stone and Webster in Boston. From 1920 to 1922 I was assistant superintendent of distribution of the Ponce Electric Co., Ponce, Puerto Rico. Who am I?

From 1922 to 1934 I was with the Blackstone Valley Gas and Electric Co., Pawtucket, R. I., as manager's assistant, assistant chief engineer and assistant to the president. I served as engineering analyst with Stone and Webster Service Corp. in New York for a year. Two years with the government in Washington as expert engineer analyst preceded a return from 1937 to 1940 to Stone and Webster in New York, first as head of the rates and analysis department and later additional duties as personnel director. I joined the Sierra Pacific Power Co. in Reno in March 1940, as assistant manager. From December 1940 to July 1942 I was manager; and have been president and manager and director since July 1942. Who am I?

I am a member of the Reno Rotary Club and have served as vice-president and director of the club and as chairman of the annual district conference held in Reno in 1943. Other civic activities include director of the Reno Y.M.C.A., member of several Reno Chamber of Commerce committees, and service on War Bond, Community Chest and other drives of Reno and Washoe County. I have been an active PCEA member since 1940. I was appointed to the board of directors in 1942 to fill an unexpired term, and was reelected this year. I am married, have a 17-year-old daughter, Betty, and my name is: See page 112.

War Conference

Northern and southern meetings scheduled

ANOTHER PCEA War Problems Conference, of the type that has proved so valuable, will be held in Los Angeles on Wednesday, Oct. 27, at the Ambassador Hotel, and in San Francisco on Wednesday, Nov. 4, at the Fairmont Hotel. A profitable interchange of ideas on the solution of warborn difficulties in the industry will be effected as the meeting proceeds through a streamlined program of round-table discussions.

Headlined will be wartime operating problems, manpower training, WPB and OPA regulations, and dealer problems. The latter will center about contemporary matters of appliance maintenance and repair, as well as future plans for taking care of the public demand when manufacture of appliances is resumed after the war.

The program to be presented is the result of concentrated effort of the three PCEA sections — Business Development, Operating Economics and Administrative Services. Guidance committees gave considerable concentration to details of the meeting so that it will give high value received for the time PCEA members spend attending it.

Frank C. Angle, San Francisco manager of Allis-Chalmers Mfg. Co., will preside in his capacity as president of the Pacific Coast Electrical Assn.

Attend Ohio Meeting

Preparation for some of the promotional and development programs that will be necessary when the war is over, as well as consideration of subjects pertinent to keeping the electrical equipment of the home today in operation, were the high points of the two-day meeting of the International Association of Electrical Leagues at Cincinnati, Sept. 16 and 17, attended and addressed by J. Clark Chamberlain, manager, Bureau of Radio and Electrical Appliances of San Diego County; and Victor Hartley, managing director, Pacific Coast Electrical Assn. In the election of new officers, both were placed upon the board of governors of IAEL. More complete reports of the impressions gained and the information of value to this region obtained by these Westerners are promised for the next issue of ELECTRICAL WEST.

Electriquiz

J. Clark Chamberlain, secretary-manager of the Bureau of Radio and Electrical Appliances, San Diego, is the author of this timely Electriquiz. For answers see page 112.

1. Production of what major electric appliance was reduced sharply *before* Pearl Harbor?
2. What was the first electric appliance to be brought under governmental sales control *after* Pearl Harbor?
3. What small appliance has been most sought after and the most difficult to obtain in 1943?
4. In what general type of appliance repair work have women proved most satisfactory?
5. What radio part is most needed today to put out-of-service sets back into playing condition?
6. In what order do the following appliances rank in point of numbers in use in the homes of the U. S.—refrigerators, percolators, vacuum cleaners, radios, electric irons, washers?
7. Name two used electric appliances over which OPA price control is maintained by specific regulation.
8. Which of the following has the best chance of obtaining a new electric refrigerator: (a) A worker in an aircraft plant who lives in a government housing project where refrigerators are not furnished. (b) A Navy man with a family. (c) A doctor whose present refrigerator is beyond repair.
9. What California resident is known as the "father of radio?"
10. Repairmen for which electric appliance have the highest current preference as to draft deferment?

Los Angeles Electrical Estimators reopened their fall meetings Sept. 30 at the Chamber of Commerce Building. E. S. McKittrick, president of the E. S. McKittrick Co. and prominent general contractor, spoke on *Postwar Planning From the Contractors' Standpoint.*

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ORIGINAL COST VALUE ORDERED IN UTAH CASE

Utah Power & Light Co. was ordered to reduce its rates $1,504,644 annually, based on 1941 earnings, at the conclusion last month of rate hearings which had been before the state public utilities commission since November. A public hearing on the company's new rate schedule was set for Oct. 6, after which the commission will act upon the company's request for a rehearing.

Main point at issue was the determination of a rate base. In its order, the commission held that valuation of the utility for rate making purposes should be established at $63,970,254, founded on actual investment as of Dec. 31, 1941. The company had contended that value should be based on reproduction cost new of its property.

Fair rate of return was set at 6%. The commission contended the order conservative in that the reduction was based on 1941 figures instead of on the higher revenues experienced in 1942 and 1943.

Electric operating revenues of the company in 1941 were $11,841,944 and, according to the commission report, total cost of service was $10,337,300. Difference between these figures represented excess earnings, the commission contended.

In a dissenting opinion, Commissioner Donald Hacking concurred in the amount of the rate base and the fair rate of return, but held for a reduction of $1,000,000 based on 1942 business, with excess returns above 6% to be used for a postwar maintenance and rehabilitation fund not to exceed $300,000 a year, the remainder being returned to the ratepayers.

Removed from the company's capital accounts was about $30,000,000 representing the company's common stock held by Electric Power & Light.

In asking a rehearing, the company declared that adoption of the original cost theory instead of present value as a rate base would deprive the utility of its property without due process of law. It also contended that the commission order had compelled abandonment of the company's plan for refinancing $44,000,000 in bonds and that any new plan, if it could be accomplished at all, would require a higher interest rate than would have been necessary under Hacking's plan.

Petition of the War Department to intervene in the case to obtain lower rates for army installations in Utah will be heard on Oct. 6, the day set for the public hearing.

Also pending is a FPC order directing the power company to dispose of $27,000,000 resulting from asserted "write-ups" and other improper charges. This ruling also has been appealed by the company, which maintains that its accounts are subject to control of the states of Utah, Idaho and Wyoming, in which it operates, and not of the Federal Power Commission.

Dimout Modification in Prospect for West Coast

Some modification of the dimout proclamation for the West Coast was in prospect, press conferences with Lieut. Gen. Delos C. Emmons, commanding Western Defense Command, indicated and a new proclamation was expected about Oct. 10. Probable elimination of some inland dimout zones, additional street lighting in certain cities not visible from the sea and changes in headlight requirements were indicated in these preliminary conferences.

This word came shortly after the change in command, in which Lieut. Gen. John De Witt was transferred to Washington, D. C., and the Fourth Army and Western Defense Commands separated, with Lieut. Gen. Emmons in charge of the latter. The military situation has materially improved, it was said, and while sporadic enemy attacks were still possible, civilian defense would be placed on a basis of "calculated risk."

Imperial Valley Purchase Ratified by Voters

Voters of the Imperial Valley approved purchase of California Electric Power Co. properties in the district at an election on Sept. 16. Vote was 1,862 for and 991 against the purchase.

A revenue bond issue of $6,000,000 was provided to cover the $4,900,000 purchase price of the properties and preliminary expenses and improvements.

California State Railroad Commission approval has been given to the purchase, which covers distribution facilities in the Imperial and Coachella valleys.

PG AND E TAKES WARTIME OUTPUT OF SHASTA DAM

Contract between Pacific Gas and Electric Co. and the Department of the Interior for the first 150,000-kw. block of Shasta Dam power was signed Sept. 16. Guaranteeing the government at least 2,700,000 annually for the period, the contract will expire two years after the end of the war or on Dec. 31, 1947, whichever date is later. In no event will it run beyond Dec. 31, 1949.

PG and E will take delivery of the power at its Shasta substation, about 25 miles below Shasta Dam. The company will lease from the government for $75,000 annually and will operate and maintain the section of the 97-mile Shasta-Oroville line extending from Shasta substation to Oroville. This line, which will be in effect a tie line in PG and E's transmission system, will be used about six months of the year to transmit Pit River power down the east side of the Sacramento Valley by way of Oroville. Shasta power will be transmitted during these months down the west side over existing transmission lines.

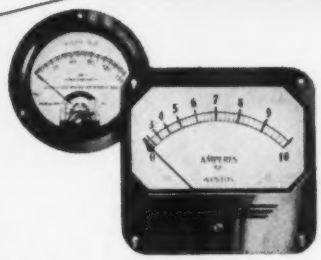
Shasta plant is expected to go into operation in March, 1944, with full output of its two 75,000-kw. units available Jan. 1, 1945. During 1944, PG and E will take as much of the energy as it can absorb and on Jan. 1, 1945, will increase its purchases to cover 150,000 kw. of power capacity and 800,000,000 kwh. annually. It will then pay a readiness-to-serve charge of $125,000 a month and an energy rate of 1.5 mills per kilowatt-hour for power taken. Payments probably will exceed $3,000,000 annually.

The government reserves the right to withdraw power up to 50,000 kw. If it withdraws as much as 25,000 kw., it may terminate lease of the Shasta-Oroville line. In this event, power would be delivered to PG and E at Oroville and readiness-to-serve charge would be reduced to $111,000 monthly, with energy rate at 1.55 mills per kilowatt-hour.

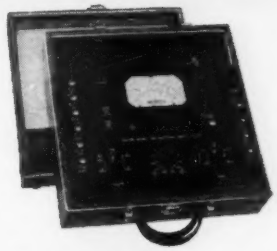
PG and E will continue to serve the government pumping plants on the Contra Costa Canal unit of the Central Valley project, but will be paid in power.

To absorb Shasta power, PG and E will reduce the output of its steam plants and will discontinue purchases of power from other sources.

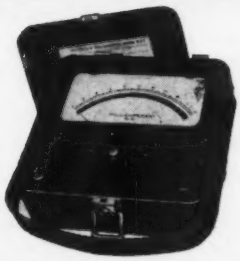
FOR ELECTRONICS MEASUREMENTS, TOO, *the Standards are Weston*



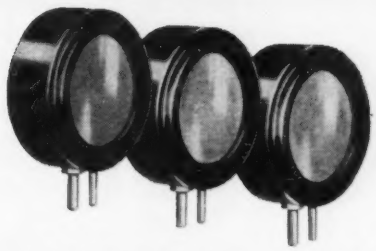
Panel Meters for Electronic applications



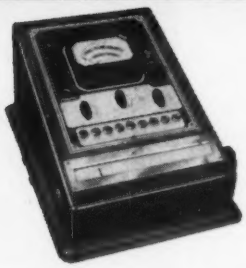
Electronic Circuit Testers



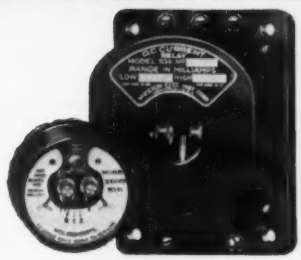
Ultra-Sensitive Laboratory Portables



*Photronic (photo-electric) Cells



Electronic Tube Checkers



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CARTER REPLIES TO ICKES IN SHASTA LINE DEBATE

Reiterating that the Secretary of the Interior and others in Washington are due for a rude awakening if they feel they can "utterly disregard the intent of the legislative and get away with it," Congressman Albert E. Carter of California last month continued his controversy with Secretary Ickes on construction of the Shasta-Oroville transmission line by the USBR.

A heated correspondence between the two men began when Carter took to task Ickes and others in the Interior Department for ordering the line built after Congress had removed specific funds for such a line from the department's appropriation bill. Ickes replied that the Congressman was "making a virtual gift to a privately owned utility company of a Federal investment costing the taxpayers millions of dollars."

Pointing out that disposition of Shasta power is in the Secretary's hands, Carter states in reply that Ickes not only would sell the power to PG and E but would build for them with public funds a transmission line costing $1,500,000.

Carter's letter in part:

"You, and you alone, are vested with the authority of disposing of the power generated at the Shasta Dam. That power can be 'captured' by the Pacific Gas and Electric Co. through you as Secretary of the Interior, and through no one else. For some time, you have been negotiating with the PG and E the disposition of this power. I have had nothing to do with these negotiations. The sole power and responsibility is upon you.

"Not only are you arranging to sell the power to the PG and E, but you are insisting upon building for them the transmission line with federal funds, costing $1,500,000. You referred to Santa Claus in your letter. If you are not acting in this capacity in insisting upon constructing this transmission line for the use and benefit of this company, then I am unfamiliar with the tradition of Santa Claus.

"This transmission line will be used exclusively by the company, not only for Shasta Dam power, but for other power that they will generate in their own plants. This line is a tie-line between two of the main transmission lines of the company and extends from the Shasta substation, which is 25 miles from the Shasta power house, to Oroville, which is about 90 miles. Regardless of who builds the line, you are going to deliver all the electric energy to the PG and E. Since that is

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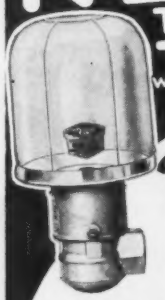

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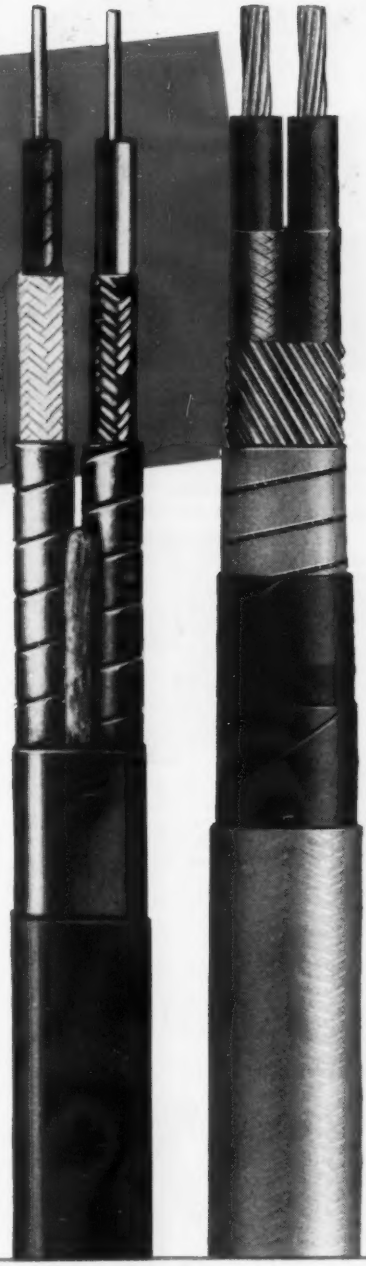

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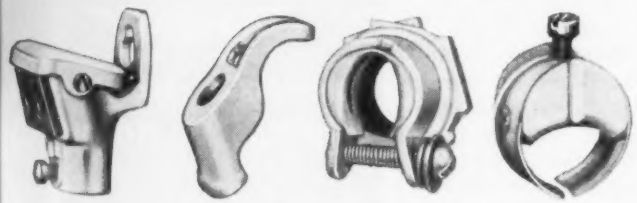

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FOR FURTHER INFORMATION on G-E BraidX, service entrance cables, electrical fittings, building wires or wiring devices, see the nearest G-E Merchandise Distributor or write to Section CDW-1033-18, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

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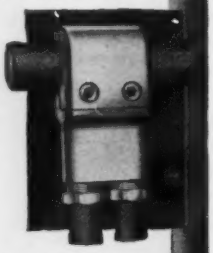

Penn-Union Hinged E-Z Tee takes a wide range of branch sizes. One-piece design makes installation easy. Tap connections can be made at any time.

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the case, the committee favored delivering the power at the Shasta substation and avoiding the necessity of a useless expenditure of $1,500,000.

"It was the judgment and the decision of the sub-committee making appropriations for your department that this line should not be built with public funds. This course was adopted by the Appropriations Committee, the House and Congress. Therefore, the important question at issue becomes, will an executive officer completely disregard the intent of the legislative branch of the government?

"Since my return home, I have had many round-table discussions with various groups of my constituents. The one thing about which they are alarmed more than any other, is the growing bureaucratic control in our National Capitol.

"They desire to have Congress assert itself. Congress has spoken in this matter, and you are acting in utter disregard of this legislative intent. This is the bureaucratic attitude about which my constituents are complaining. Your action, so out of harmony with the legislative intent, is an attack upon representative government . . . "

Commission Revises Order In Arizona Rate Case

Nullifying its original $175,000 electric rate reduction order to the Tucson Gas, Electric Light and Power Co., the Arizona Corporation Commission last month issued a new order which it estimates will bring annual savings of $150,000 to the utility's customers.

Appeal on the commission's original order was before the U. S. District Court, with hearing set for Oct. 4. An earlier appeal to the commission for a rehearing had been denied.

The commission order was based on savings to the company from receipt of power from Parker Dam. In appealing, the utility stated that since the order was entered, the company's assessed valuation had been increased $1,200,000, resulting in a $60,000 annual tax increase.

It was not believed that the new order would be contested.

● SALE of Western States Utilities Co. by Peoples Light & Power Co. to Gerald L. Schlessman of Denver was reported last month. This company operates in the states of Idaho, Wyoming and Nevada, supplying electricity to Malad City, Idaho, and Cokeville, Wyo., and electricity and water to Winnemucca, Nev. Headquarters, which have been in Portland, will be moved to Denver, it was announced following the purchase.

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LIKE a leaf floating downstream, we are being carried along toward a new and uncharted economy. What this new economy will be like will depend, to no small extent, upon what industry does or fails to do during the coming months. Time is short; in fact, we may suddenly find ourselves standing on the threshold of a peace economy with our war boots still on our feet.

While bending every effort to win the war, we cannot afford to be caught unprepared for the peace. As Prime Minister Churchill said at Harvard, we are "bound, so far as life and strength allow and without prejudice to our dominating military task, to look ahead to those days which will surely come, when we shall have finally beaten down Satan under our feet and find ourselves with other great Allies at once the masters and the servants of the future." Unless we do look ahead, there is danger that we may become neither the masters nor the servants, but merely the victims, of the future.

The war has quickened our ailing economy and opened our eyes again to the possibilities of peace-time plenty. But it has also brought great dislocations of labor and capital; it has led to abnormal patterns in prices and income distribution; and it has created inflationary pressures with enormous potential powers to injure or to help us in the transition from war to peace.

The pattern of life in postwar America will be just what we make it. All of us will have a hand in shaping that pattern, but business men will have a special responsibility in the reconstruction. As employers of labor and capital and as enterprisers assuming the risks of new ventures, they will have to plan and carry out the conversion from war work to full peace-time production. Because of their key role, business men have a special opportunity to discover, and to help others to understand, the conditions which are necessary if they are to do their job satisfactorily.

This is a narrow view of postwar problems but it is a central view, because no one condition is more vital to the health of the world than a high level of production and employment in the United States. We cannot hope to lead the world out of economic chaos if we fail to put our own house in order. If we fail to adjust our domestic economy, we may destroy Adolf Hitler; but we will not destroy the germ that breeds "Hitlers." If we do not maintain the production necessary for supporting a large volume of imports and exports, then the plans for international monetary stabilization, for good relations with our neighbors, for rehabilitation of stricken countries, and for strengthening the democratic bulwarks against dictatorship are all likely to come to grief. We must demonstrate our capacity for world leadership, or be content to follow the leadership of others.

The prospects for achieving a sound and vigorous economy in the United States are not so good as to warrant complacency on the part of men genuinely interested in free enterprise and the political freedoms incident to it. We have yet to find means to utilize our vast and abundant resources for the good of all. We have yet to learn how to keep men from the terrible experience of unemployment and the fear of want which makes them willing to sacrifice freedom and opportunity for almost any promise of security. We have yet to reconcile the conflicting interests of labor, agriculture, and business so that they can work together effectively. We have yet to learn how to check the fever of inflation and cure the palsy of depression.

When we were attacked at Pearl Harbor, we realized our physical peril immediately and united in a tremendous common effort against the enemy. The onset of economic perils is less obvious. No bombs will signal the deterioration of the private enterprise system, the extension of regimentation, the further control of busi-

ness by government, and the concentration of political power in less and less responsible hands. If these things should befall us, they will come insidiously while we are preoccupied with self interests and oriented by popular misconceptions. If the freedoms of the individual shrivel as the state grows in power, it will be because the individual is too indifferent or complacent to concern himself seriously with economic problems. If our people are misled by false prophets and demagogues, it will be because business men did not understand economics, because scholars were too ignorant of practical affairs, and because we failed to produce economic statesmen of sufficient stature for the task in hand.

Thinking is hard work. Thinking about things outside our personal experience, about economic processes that are broader and in some fundamental respects different from buying and selling or running a business – is strenuous mental labor. Thinking straight about problems that are beyond our personal and immediate status and our pocketbooks, thinking about problems that involve nation-wide production, nation-wide employment and nation-wide buying power – in other words the operation of our entire economic system – involves real self-discipline. Yet there is no other way to safeguard our freedoms. We cannot rely on trial and error; tinkering takes too long; social experiments which turn out wrong can be undone only at great cost – if at all. If we proceed blindly, we shall flounder into an economic and political morass from which we cannot escape.

We floundered badly all through the Thirties, until the war lifted us temporarily to higher ground. When the war boom is over, we shall be back floundering worse than ever unless we find a solid road along which to proceed.

America has grown rich and strong under a system of political and economic freedom. Opportunity and the necessity of self-reliance have brought forth great accomplishments. The hope of profit and the spur of competition have urged men on to find new and better products, new and better methods, and to risk their savings in pioneer investment. Never has a country achieved so high a standard of living and afforded so large an opportunity for the individual man and woman. It is not surprising that some distinguished business leaders, looking back over their own experience, tell us that everything will be all right if only there is "less government in business."

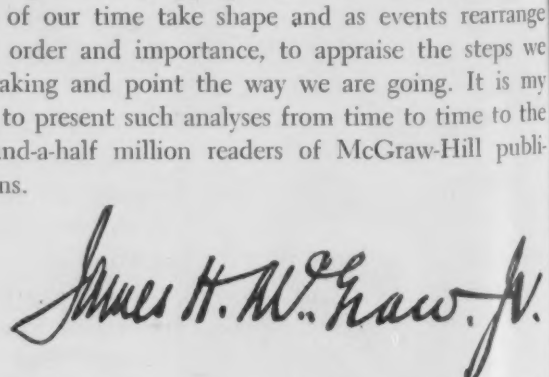
I wish the solution were as simple as that. However this is only part of the answer. It is becoming increasingly clear that industrial capitalism as we know it contains within itself certain fundamental weaknesses which can lead to its destruction if they are not counteracted. No democracy can survive when twenty to thirty per cent of its workers cannot get jobs. That happened here in the Thirties. For years on end, despite fumbling efforts at recovery one out of every five workers was denied a chance to earn a living in private business. We shall never again have such mass unemployment as occurred in the bottom of the Depression, because the government will take it upon itself to create jobs if business cannot offer them. Whenever that happens, however, the area of private enterprise will be reduced and that of government will be expanded – and the concentration of political power will be increased. This is the challenge we business men face today, and ours is the first opportunity at finding the solution.

The crux of our economic problem is unemployment. Unless there are jobs for ninety to ninety-five per cent of those who are able and willing to work, there will be widespread fear and lack of opportunity, which will drive labor unions, agricultural groups, and business interests to take self-protective measures. Such measures are certain to restrict production, stifle progress, and imperil our democratic way of life. Not all our problems will automatically be solved if we learn how to avoid mass unemployment, but they will at least then have a good chance of solution.

And so American businessmen face a great responsibility! We will have to find the answer to a great many momentous questions. We will have to delve into problems that cannot be solved by precedent.

Looking backward to these times, future historians are likely to say that here we Americans stood at the crossroads and, consciously or not, made our choice between a system of private enterprise and personal freedom and a system of collectivism and regimentation.

It is particularly appropriate, therefore, as the problems of our time take shape and as events rearrange their order and importance, to appraise the steps we are taking and point the way we are going. It is my plan to present such analyses from time to time to the one-and-a-half million readers of McGraw-Hill publications.



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They eliminated the use of considerable metal—*yet produced a sturdy, substantial lighting fixture.* They went over to building's proven material, Masonite—*for lightweight but extremely durable reflectors.* They redesigned the reflectors—*yet did not sacrifice lighting efficiency.* They simplified construction features—*so starters could be conveniently located between lamps—so ballasts could be exposed for cooler operation.*

AND — in addition to providing it in single unit 4-foot and 5-foot lengths—*it is available in double lengths, 8-foot and 10-foot.* It is the strength and rigidity of these double lengths that again make possible *real continuous-row fluorescent lighting* with its savings in installation cost.

These are the highlights. There's a lot more to the story—*important to you right now.* Better write for full information.

QUICK FACTS FOR FAST READERS

IMPROVED DESIGN of the MILLER continuous fluorescent lighting system, introduced in 1939.

RUGGED LIGHTWEIGHT EQUIPMENT — with sturdy, Masonite reflectors—and no reduction in lighting efficiency.

EXPOSED BALLASTS — for cooler operation — with starters conveniently located between lamps.

HIGHER ILLUMINATION — 30, 40, 50 or *more* foot candles. Units available in 4-foot and 8-foot lengths for 40-watt lamps — in 5-foot and 10-foot lengths for 100-watt lamps.

INSTALLATION SAVINGS from 30% to 50% possible through the use of rigid double length units in a continuous-row lighting system.

SIMPLIFIED MAINTENANCE — reflectors are so easy to handle and remove that women workers can take care of them.

SAFETY "PLUS" — the MILLER patented Safety Lamp Lock is available as an integral part of each socket, minimizing the danger of falling lamps.

THE MILLER COMPANY • MERIDEN, CONNECTICUT

ILLUMINATING DIVISION
Fluorescent, Incandescent
Mercury Lighting Equipment

OIL GOODS DIVISION
Domestic Oil Burners
and Liquid Fuel Devices

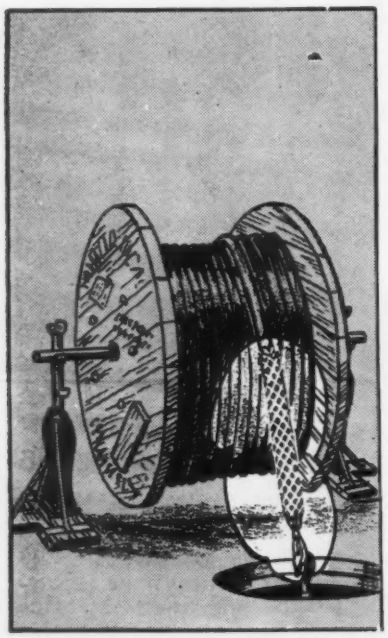
ROLLING MILL DIVISION
Phosphor Bronze and Brass
in Sheets, Strips and Rolls

WAR CONTRACTS DIVISION
War Materiel

MILLER
SINCE 1844

SPEED

CONSTRUCTION and EXPANSION of PLANT FACILITIES



RELIABLE CABLE GRIPS

For Pulling in Wires and Cable

These grips can be installed quickly and pull cables dependably. They do not let go halfway through a duct because wires pull with evenly distributed load. Eight different styles—all supplied in a full range of sizes.

Reliable ELECTRIC COMPANY
OVER 35 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE · CHICAGO ILLINOIS

CO-OP GOVERNING AGENCY AT ISSUE IN COLORADO

Twice within as many months, authority of Colorado Public Utilities Commission to govern rural cooperatives, operating with Rural Electrification Administration funds, has been challenged.

In August, the PUC declared San Miguel Rural Power Co. a public utility (because it served customers outside its own membership). Notice of appeal to the district court was filed and hearing date set for Oct. 4. In September, transfer of holdings and certificate of public convenience and necessity by the Highland Utilities Co. in Montezuma County to the Empire Electric Assn., affiliate of REA, was stalemated when James A. Noland, attorney for the co-op, declared intention of his client to solicit business in, and serve, the town of Cortez, Colo., regardless of membership in E.E.A., asserting the PUC had no authority to govern his client's affairs.

The point in question is the franchise given the Highland Utilities by the town of Cortez. The town is insisting that the deal between the privately owned concern (Highland Utilities) and the REA unit shall include the terms of the present franchise. Otherwise the town is not concerned as to who shall furnish electric service. The community's mayor, representing his town council, stated that his reason for insistence is that municipal ownership of an electric generating plant and transmission system has been authorized by citizens of Cortez; that the town desires PUC protection on rates that might otherwise be forfeited; that since municipal ownership is contemplated (despite present restrictions on critical materials which render immediate construction impossible), the town wishes to reserve its right to condemn and purchase the electric system at the stated five-year intervals provided by the franchise now held by the Highlands Utilities Co.

Most details incident to the proposed sale of Highland Utilities to Empire Electric can be ironed out, so far as the town of Cortez is concerned. However, until it is clearly shown that the community's rate structure will be guaranteed as existing now, and that its right to condemn and purchase is preserved, the town announced its intent to oppose the transfer. For the same reasons, the town council requested careful consideration of all citizens of Cortez before any individual memberships in the REA association are signed up. Notice to this effect was published in the Cortez *Journal* after the abortive hearing at the state capital building in Denver, Colo.

A date for resumption of the hearing will depend on Empire Electric Assn.'s filing of new briefs; it was given 10 days in which to file, and 15 days thereafter a hearing will be held.

Legal phases of the controversy hinge on these questions: Does a rural cooperative, by reason of its operation with government (REA) funds, become a national, rather than a state agency? Does the fact that a rural cooperative serves other customers than its own membership constitute it a public utility? (The Colorado PUC contends such acts place the co-op in that category) Does the co-op's contract with the REA, stipulating that money loaned shall only be used to provide electrical service for those who are not now receiving service from another source, mean what it says?

Testimony indicated that the REA agreed to terms of the franchise between the town of Cortez and Highland Utilities. However, in view of Empire Electric Assn.'s attitude at the hearing, the community's officials felt its interests would not be protected without supervision of contract terms by the state PUC.

Court Hears Demurrer in Sacramento Proposal

Hearings began Sept. 17 in the Sacramento County Superior Court in connection with Pacific Gas and Electric Co.'s demurrer to the condemnation suit brought by the Sacramento Municipal Utility District. The district seeks to convert the Sacramento distribution system of PG and E into a publicly operated enterprise.

The California State Railroad Commission last November set a valuation of $11,632,000 on the properties. Appeals by the utility district and PG and E for a rehearing in the valuation case were denied by the commission as was a district request for a review by the California State Supreme Court.

Superior Judge C. J. Goodell of the San Francisco Superior Court is hearing oral arguments in the condemnation case.

● A MAGNESIUM SILICATE contained in the Windous magnesite deposit near Ely, Nev., may become a substitute for talc, used in electrical porcelains, according to a report by the Interior Department following a Geological Survey study.

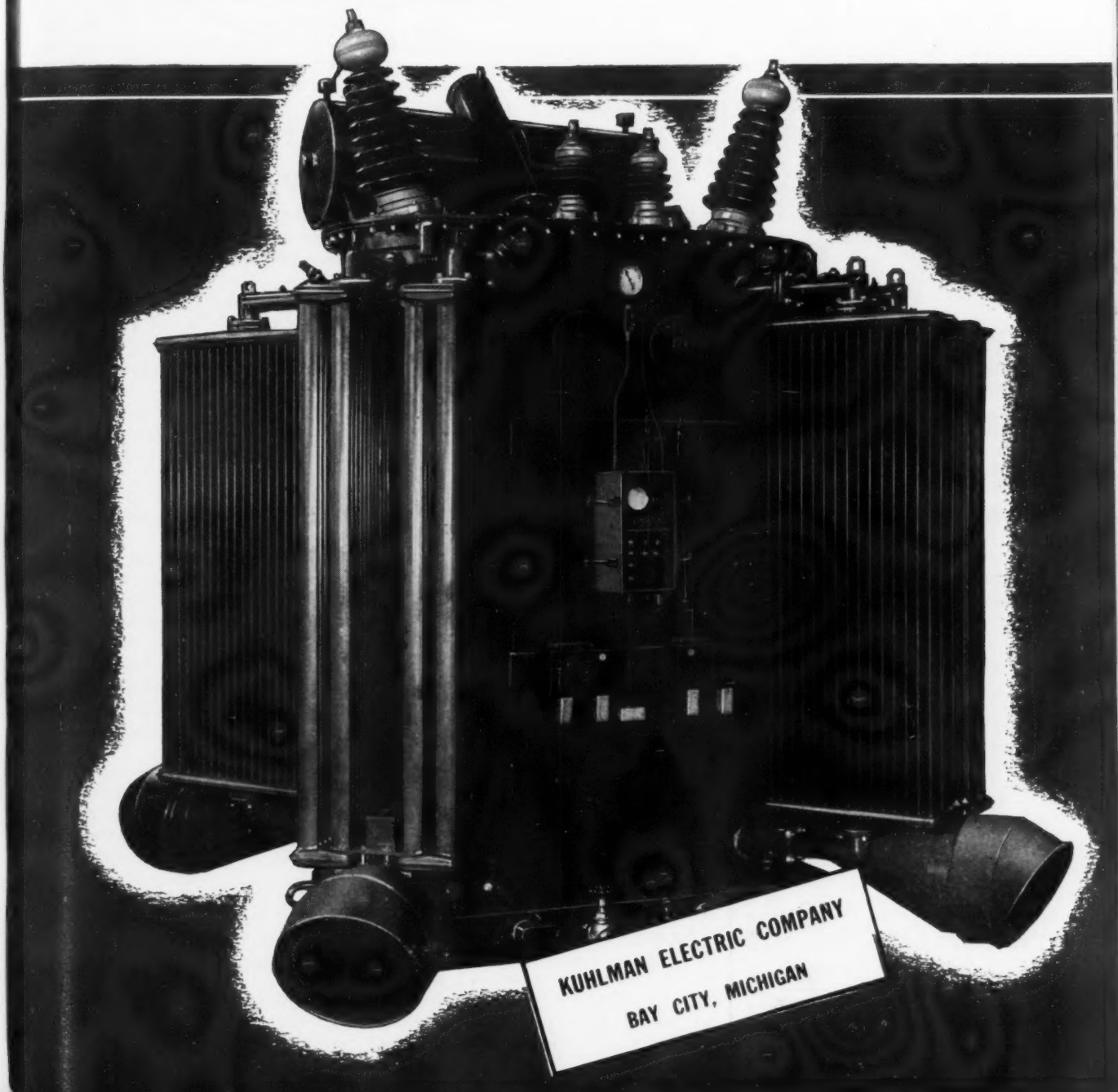
● BONNEVILLE's ninth generating unit went on the line in September to add 54,000 kw. of rated capacity at the dam. The tenth unit, scheduled for completion by Dec. 1 will bring rated capacity to 518,400 kw.

READY TO TAKE ON 2500 KVA OF AMERICA'S INCREASING POWER DEMAND

IN MARCH, 1941, America's power output totaled 2,983,000,000 Kw-Hr. In March, 1943, it had increased to 3,947,000,000 Kw-Hr. Kuhlman Transformers have been playing an important role in helping to handle this increasing power demand.

The unit shown here (low voltage side of a 2500 KVA conservator type, single phase, 60 cycle, 69000-7200/12470 Y volts with 4—2½% taps) is typical of the many efficient transformers built by Kuhlman. Tap changers are brought out from the side of the tank. Temperature control for blower motors and wiring in conduit boxes. Blowers installed between radiators and structural steel construction throughout.

If you are interested in dependable, efficient transformers, it will pay you to get the facts about Kuhlman's.

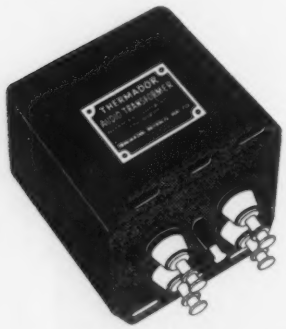


DEFEATS

HEAT

COLD

HUMIDITY



THERMATITE TREATED

THERMADOR TRANSFORMERS

Thermador Transformers are Thermatite treated to withstand extreme temperatures and humidity—arid or moist heat—dry or damp cold do not hamper their efficiency. Thermatite is the name of a process of accurate heat controlled vacuum impregnation developed and improved over a period of ten years.

Thermador also manufactures built-in Electric Heaters, Electric Ranges, Electric Water Heaters.

THERMADOR
Electrical Manufacturing Co.
5119 S. Riverside, Los Angeles
"Seven Leagues Ahead"

NEW PUD CONTRACT SAVES FPHA $41,905 ANNUALLY

Reducing the cost of electric service $41,805 annually, the Federal Power Commission last month approved a revised contract between Clark County (Wash.) PUD and the Federal Public Housing Authority for service to the $70,000,000 Vancouver Housing Project. The contract applies the terms of the President's Oct. 22 "cheapest power" directive.

Renegotiation of the contract was insisted upon by FPHA after Rep. J. William Ditter, Pennsylvania Republican, stated in Congress that the PUD "sits between two other federal agencies and collects $50,000 a year for rendering absolutely no service."

Having purchased from FPHA about 26,800 feet of transmission lines running from the Bonneville Power Authority substation to the project sites, the PUD will now:

1. Sell power to FPHA at the same rate it buys the power from BPA, the Bonneville F-2 rate.

2. Collect a 6% yearly return on the cost of the line, which was approximately $39,500.

3. Collect approximately $4,000 a year amortization charges.

4. Collect approximately $1,530 yearly for operation and maintenance expenses and insurance on the facilities.

5. Collect approximately $3,830 yearly for the allocated portions of the general and administrative expenses.

6. Collect approximately 5% a year of the cost of facilities for taxes.

FPHA would offer no estimate of the amount it would have to pay each month over and above its energy payments at the Bonneville F-2 rate, but the sum would appear to be in the neighborhood of $1,100 monthly.

The revised contract provides that the cost of the facilities purchased by Clark County be amortized on a 6% sinking fund basis, with the facilities used to serve permanent parts of the project amortized over 25 years and those used for temporary parts of the project amortized over five years. The contract provides also that amortization payments for the facilities used to serve temporary parts of the project shall stop short of the five-year period if the temporary parts of the project are liquidated before then.

Approximately $7,000 of the facilities cost was charged to permanent installations, and in excess of $31,000 was charged to temporary installations for amortization purposes. Approximately $9,000 net of the charges against temporary installations is estimated to be salvageable.

The contract between the PUD and the project for repair and maintenance service on FPHA facilities remained unchanged. The $41,800 reduction was based on an estimated 90% occupancy rate.

The Bonneville F-2 rate entails a demand charge of approximately 75 cents per kilowatt and an energy charge of 2½ mills per kilowatt-hour, with a reduction of ½ mill per kilowatt-hour on all power with a load factor higher than 50%. FPHA estimates that the project, when completed late this year, will have a demand between 10,000 and 12,000 kw. with a 45 to 55% load factor.

The project, with a top capacity in the neighborhood of 40,000 persons in about 17,000 dwelling units, including dormitory rooms, will serve the Kaiser shipyards in Vancouver, Swan Island and Richmond, Wash. More than 90% of the project is temporary.

PUD Would Compel Wholesale Power Rates from Utilities

Public Utility Districts No. 1 of Okanogan County and Clallam County have filed complaints with the Public Service Department at Olympia, Wash., to compel wholesale power rates from the Washington Water Power and the Puget Sound Power & Light companies.

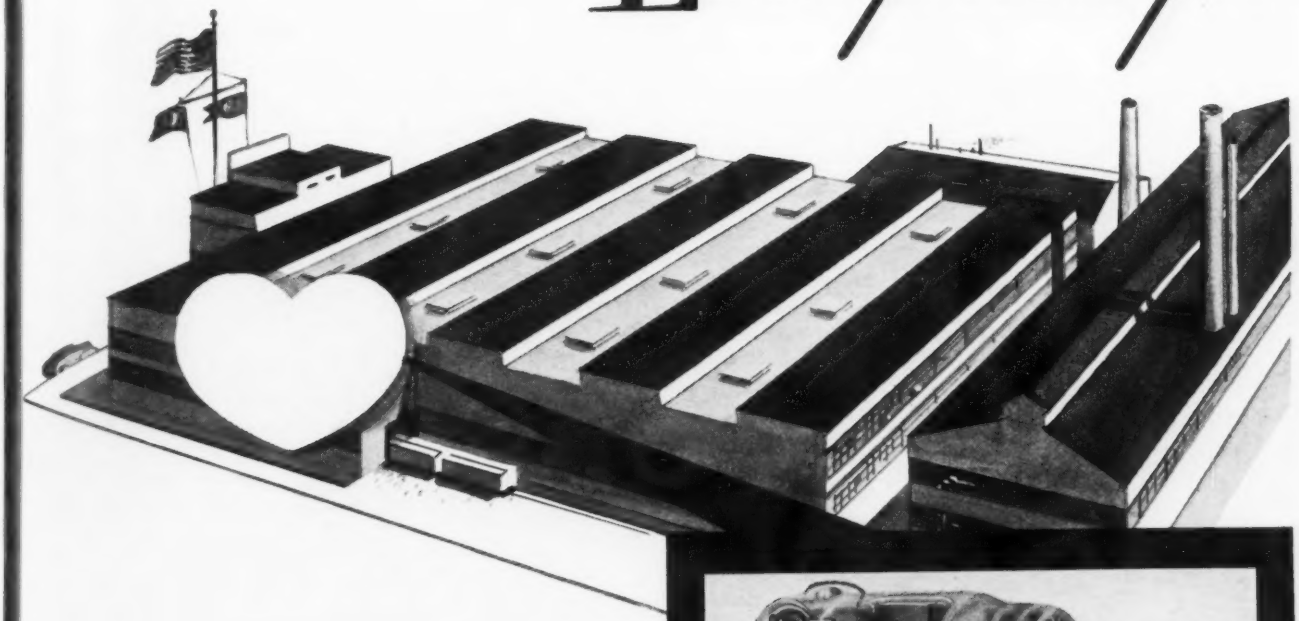
Condemnation actions through which the utility districts seek to acquire electrical works and facilities of the two plants have been instituted in Superior Court. The two districts desire the wholesale rates to help them to determine the cost and revenue of the two companies pending acquisition.

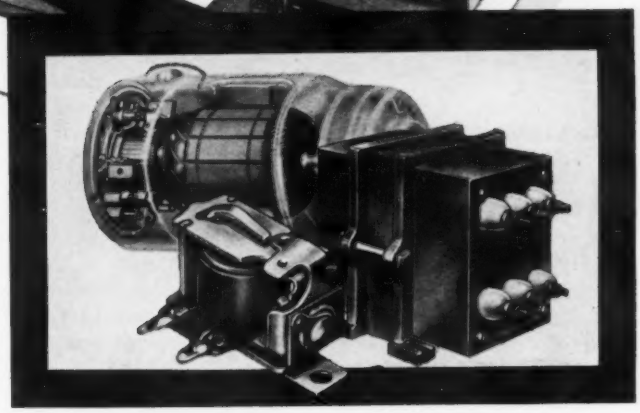
● A NATIONAL SECURITY AWARD has been established by the United States Office of Civilian Defense to give public recognition to outstanding achievement in protection of employees, plants and production schedules from air raids, fire, sabotage and accident. Electric utilities are among the organizations announced as eligible for this award.

● CLERICAL WORKERS in the Sacramento division of Pacific Gas and Electric Co. will be represented in collective bargaining by the AFL International Brotherhood of Electrical Workers, the NLRB announced last month. Of 191 eligible, 111 workers cast ballots, with 94 for the union and 17 against.

● KODIAK (ALASKA) ELECTRIC ASSN., Inc. has been awarded REA funds totaling $100,000.

Everything...





...FOR THE HEART OF YOUR ELECTRICAL SYSTEM

Keeping vital electrical machinery from failing requires routine maintenance and occasional repairs. And securing the materials you need for this work is Tri-State's job.

Representing eight large factories, Tri-State has a complete line of wiring, winding necessities and vital parts for motors, generators, starters, transformers and relays. Among the products available are insulated wire of many types, commutators, brushes, resistors, varnishes, insulating tapes and paper, fibre, bearings and cambric insulation.

One of the big problems in both the manufacture and maintenance of electrical equipment today is getting materials when they are needed. Tri-State can help you solve this difficulty by furnishing application and engineering information, by helping anticipate future requirements so orders can be placed well in advance, and by expediting the actual delivery of your supplies.

Wire or phone today for more details of Tri-State's services—and how they can be used to your advantage.

A PARTIAL LIST OF ELECTRICAL ITEMS AVAILABLE AT TRI-STATE

- Essex Flexible Lead Wire
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- Vartex Varnished Cambric
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- Mica Segments and Rings
- Ohio Carbon Brushes
- Homer Commutators
- Neatpak Solder
- Dielectric Friction Tape for General Use
- Trico Armature Twine
- Trico Slot Wedges
- Banding Wire
- Trico Crepe Insulation
- Essex Magnet Wire
- Case Pressboard
- Scotch Flat Back Electrical Tape
- Bunting Motor Bearings
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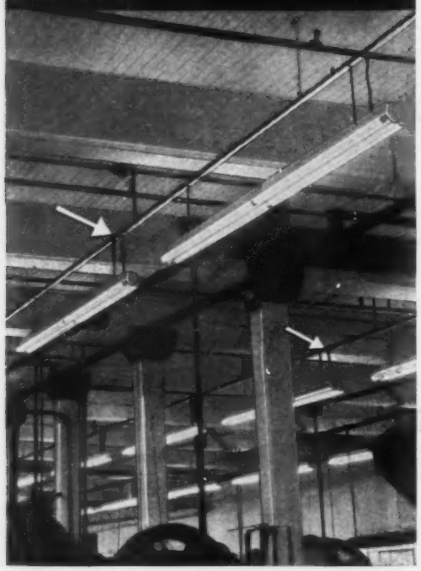
WIREMOLD

WIRING FOR LIGHT
. . . FOR WORK



AID
to war production...

The photograph above shows an interesting new use of No. 2100 PLUGMOLD as a wiring system for fluorescent lighting. The rigidity of No. 2100 made it possible to span factory beams and to suspend the fluorescent units from the channel itself. Wiremold polarized outlets No. 2127 P, spaced on approximately 10 foot centers, provide for easy disconnection of individual units for maintenance. By means of this polarized receptacle it is possible to satisfactorily ground the fluorescent units.

AID
to future planning...

Wiremold Engineers . . . and Wiremold Contractors and users . . . are accumulating a wealth of ideas in application that will help industry save time and money in reconverting to civilian production.

Keep abreast of what Wiremold can do for you today and its potentialities for tomorrow. Be sure your name is on our list to receive new bulletins and data sheets now available or to be issued shortly.

Conforms to Federal Specification W-R-32. Listed by U. L. Immediately available on suitable priority. The Wiremold Company. Hartford 10, Connecticut.

WIREMOLD

CAN HELP YOU PRODUCE FOR WAR . . .
AND PLAN FOR PEACE!

USBR OPENS SIX FIELD OFFICES IN NEW SET-UP

A reorganization plan, establishing six major field offices each headed by a regional director, has been adopted by the Bureau of Reclamation. Headquarters of the six regions will be at Boise, Idaho; Sacramento, Calif.; Boulder City, Nev.; Salt Lake City, Utah; Amarillo, Texas; Billings, Mont.

According to the USBR announcement, decentralization of the bureau will provide for a better understanding of the needs and potentialities of each area than has been possible through the Washington, D. C., headquarters and the Denver engineering office.

Under the new set-up, regional directors will be directly supervised by the Commissioner of Reclamation. Their duties will include negotiation of power sale contracts; negotiation of construction repayment contracts with water users; coordination and integration of construction projects with other bureau operations in the region; dissemination of public information on bureau activities. Also under their jurisdiction but subject to technical control of the functional branch heads will be investigation of proposed projects and execution of agricultural and other economic development programs.

The plan also provides four branches —Design and Construction; Project Investigations; Operation and Maintenance; Fiscal and Administrative Management—to be located at Denver and supervised by the Reclamation commissioner.

Regions and their directors:

1. State of Washington; Oregon, including the California portion of the Klamath project; Idaho, excluding the Bear River Basin; the Snake River Basin in Wyoming. Headquarters, Boise; director, Frank A. Banks, construction engineer in charge of the Grand Coulee development.

2. California, excluding the Klamath project, the Lake Tahoe watershed and the San Diego and Colorado river projects. Headquarters, Sacramento; director, Charles E. Carey, bureau consulting engineer.

3. Arizona and the San Diego and Colorado River projects. Headquarters, Boulder City, Nev.; director, Ernest A. Moritz, director of power, Boulder Canyon project.

4. Nevada, excluding the Colorado River projects; the Lake Tahoe watershed in California; Utah; the Bear River Basin in Idaho and Wyoming; the Colorado River Basin in Wyoming and Colorado, excluding the Colorado-Big Thompson and the Blue River-South Platte projects. Headquarters, Salt Lake City; director, Ernest O. Larson, construction engineer in charge of the Provo River project in Utah.

5. Colorado and New Mexico, excluding all Colorado River projects except the Colorado-Big Thompson and the Blue River-South Platte projects; Texas; Oklahoma; the Arkansas River Basin in Kansas. Headquarters, Amarilla, Texas; director, Wesley R. Nelson, chief engineering division, Commissioner's office, Washington, D. C.

6. Montana; North and South Dakota; Wyoming, excluding the Snake, Bear and Green river basins. Headquarters, Billings, Mont.; director, Harold D. Comstock, superintendent of the Riverton project in Wyoming.

New Regulations Issued For Draft Deferment

Occupational deferments for Selective Service registrants engaged in or qualified to practice one of the 149 critical occupations were made even more secure by instructions given local draft boards last month by National Selective Service headquarters.

Under the new regulations, local boards are ordered to refer to the United States Employment Service the case of any registrant, claimed to be in one of the 149 occupations, whom they find does not merit an occupational deferment and whom they classify as 1A. Coincidental with the referral, boards are required to grant a 30-day stay of deferment, during which USES will investigate the case. If USES finds the registrant to be utilizing his highest skill or that he has since been placed in a critical occupation in an essential industry, an additional 10 days will be allowed for employers to file on form 42 A or B for an occupational deferment. When such appeals are filed, local boards will be required to re-open the case and reconsider it on the basis of the new information.

The extended USES control lies in the fact that if the local board continues the registrant in 1A, an appeal will be available, and appeal boards may be expected to hew reasonably closely to the occupational deferment line laid down by WMC.

TORK CLOCKS

THE POPULAR TIME SWITCH LINE KNOWN EVERYWHERE

NOW—lower prices and higher capacities

There is a Tork Clock for every regular switching job: 60 minute, 4 hour or daily cycles.

Bulletins on request

THE TORK CLOCK CO., Inc.
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1000-KVA UNIT SUBSTATION WITH NOFLAMOL TRANSFORMER, 13,200 TO 480-VOLT, 60-CYCLE, THREE-PHASE.

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UNIT SUBSTATIONS

are doing their part in the production of steel, synthetic rubber, oil, and other vital materials

The Unit illustrated above is installed in a synthetic rubber plant. The transformer has a two-position liquid-filled disconnecting switch on the high-voltage side which is equipped with low-voltage interlock. The low-voltage side is equipped with air-break circuit-breakers electrically or manually operated, ground indication lights, voltmeters, ammeters, and ammeter test blocks. Unit has one main breaker, one tie transfer breaker, and four feeder breakers.

For Complete Information on Wagner Unit Substations write or phone the nearest Wagner branch office.

Wagner Electric Corporation
ESTABLISHED 1891
6381 Plymouth Avenue, St. Louis, 14, Mo., U. S. A.
ELECTRICAL AND AUTOMOTIVE PRODUCTS

T43-5

NO RESTRICTIONS ON

IDEAL Wire-Nuts

Solderless, Tapeless Wire Connectors Meet all Government Requirements

Solder Joints are prohibited by government order wherever another product meeting electrical requirements can be used—IDEAL "Wire-Nuts" are not prohibited—use no tin, lead or rubber as required for soldered joints.
Safer—better electrically—stronger mechanically. FULLY APPROVED. Listed by Underwriters' Laboratories, Inc. Write for free samples.

PLANT WIRING SIMPLIFIED
IDEAL "Wire-Nuts" make all plant-wiring jobs easier—safer—faster. For new circuits, changes, additions.

Immediately Available
PROMPT DELIVERY
IDEAL Sycamore
• IDEAL COMMUTATOR DRESSER CO •

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L. S. Foley, 1233 N. W. 12th Avenue, Portland, Oregon
Robinson Sales Co., 3215 Western Avenue, Seattle, Wash.

Osmoplastic treatment stops groundline decay... eliminates the need for frequent pole inspection ... and increases the service life of standing poles by many years.

Actual service records of more than 60 leading utilities, compiled from over 1,000,000 Osmoplastic-treated poles, prove beyond question that this easy-to-apply wood preservative more than pays for itself through *lower* protection cost.

WRITE for full information *today!*

OSMOSE
WOOD PRESERVING COMPANY OF AMERICA, INC.
DENVER
SEATTLE • BUFFALO • SAN FRANCISCO

SEATTLE MUNICIPAL PLANS $2,810,000 DEVELOPMENT

Postwar development projects calling for expenditures of $2,810,000 for Seattle City Light, as part of the proposed $38,000,000 public works program now under consideration by a city postwar planning commission, is announced by Superintendent of City Light E. R. Hoffman. It is recommended that more than one-half of the capital outlay for City Light go into the department's North substation and into its distribution lines. Listed were $750,000 for modernization and expansion of the substation and the same amount for the duplication of present transmission lines to the substation.

PP & L Committee Guiding Company's Postwar Plans

Postwar thinking of Pacific Power & Light Co. will be guided by a seven-man committee under leadership of D. B. Leonard, commercial manager, the company has announced.

Company planning will have a dual objective—consideration of the company's obligation to the organization and its members and to the communities served. The work is to be entirely "extra-curricular", with the all-important job of winning the war still the first concern of every member of the organization, the announcement stated.

● CLASSES designed to prepare women employees to assume a wider variety of more responsible commercial positions when necessary because of the induction of more men into the armed services is in progress in the San Joaquin Valley division of the Southern California Edison Co. M. W. Phillips, division manager, is directing the course, which is composed of two-hour sessions once a week. Subjects include rates, rules and regulations, company policies and background, industry terminology, credits, accounting procedures and public relations.

● IN A MOVE designed to help meet the critical labor shortage in the Puget Sound area, Puget Sound Power & Light Co. and Seattle City Light will institute bi-monthly meter readings and billings. The plan will apply only to City Light subscribers in the outlying districts and downtown customers will continue to receive monthly bills. Puget Sound will put the system into effect throughout its territory.

● AN REA ALLOTMENT of $18,000 has been granted to the Stevens County Electric Co-op of Colville, Wash.

HELWIG COMPANY
•
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Multiflex Brushes
Give Better
Commutation,
Longer Life,
Less Commutator Wear,
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All Around

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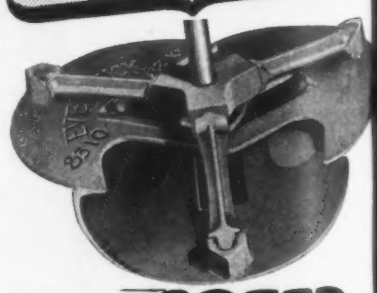
EVERSTICK ANCHORS...



FOR SPEED IN INSTALLATION

The exclusive Everstick nut housing locks the Anchor firmly on the rod. This speeds up installation. Plates are so designed, that they expand easily into undisturbed earth, and extra holding power is achieved. Made of tough, rust-resistant malleable iron. Write for bulletin.

EVERSTICK ANCHOR CO
FAIRFIELD, IOWA

Mister—you're getting paid in DYNAMITE!

LET'S NOT KID OURSELVES about this. Our pay envelope today *is* dynamite.

If we handle it *wrong*, it can blow up in our face . . . lengthen the war . . . and maybe wreck *our* chances of having happiness and security *after* the war.

The wrong way to handle it . . . and why

The wrong way is for us to be good-time Charlies. To wink at prices that look too steep . . . telling ourselves we can afford to splurge.

We *can't* afford to—whether we're business men, farmers, or workers. And here's why:

Splurging will boost prices. First on one thing, then all along the line.

Then, wages will have to go up to meet higher prices. And higher wages will push prices up some more . . . faster and faster, like a runaway snowball.

The reason this can happen is that there is more money in pay envelopes today than there are things to buy with it. This year, we Americans will have *45 billion* dollars more income than there are goods and services to buy at present prices. *45 billion dollars extra money!*

That's the dynamite!

The right way to handle it . . . and why

Our Government is doing a lot of things to keep the cost of living from snow-balling.

Rationing helps. Price ceilings help. Wage-and-rent stabilization helps. Higher taxes help. They're *controls* on those dangerous excess dollars.

But the real control is in our hands. Yours. Mine.

It won't be fun. It will mean sacrifice and penny-pinching. But it's the only way we can win this war . . . pay for it . . . and keep America a going nation afterwards.

And, after all, the sacrifice of tightening our belts and doing without is a small sacrifice compared with giving your life or your blood in battle!

Here's what You must do

Buy only what you absolutely need. And this means absolutely. If you're tempted, think what a front-line soldier finds he can get along without.

Don't ask higher prices—for your own labor, your own services, or goods you sell. Resist pressure to force YOUR prices up.

Buy rationed goods only by exchanging stamps. Shun the Black Market as you would the plague.

Don't pay a cent above ceiling prices.

Take a grin-and-bear-it attitude on taxes. They must get heavier. But remember, these taxes help pay for Victory.

Pay off your debts. Don't make new ones. Getting yourself in the clear helps keep your Country in the clear.

Start a savings account. Buy and keep up adequate life insurance. This puts your dollars where they'll do you *good*.

Buy more War Bonds. Not just a "percent" that lets you feel patriotic, but enough so it *really* pinches your pocketbook.

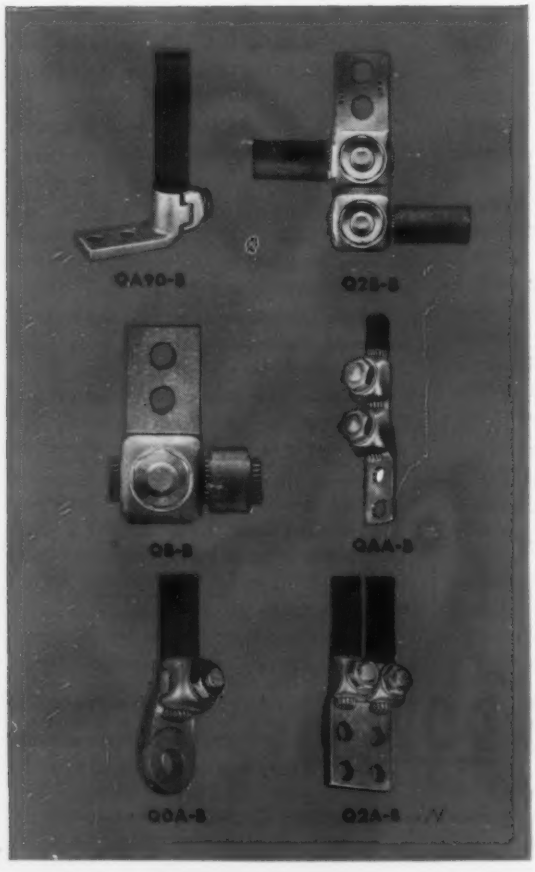
If we do these things, we and our Government won't have to fight a post-war battle against collapsing prices and paralyzed business. It's *our* pay envelope. It's up to *us*.

KEEP PRICES DOWN!

Use it up • Wear it out
Make it do • Or do without

This advertisement, prepared by the War Advertising Council, is contributed by this Magazine in co-operation with the Magazine Publishers of America.

Burndy SCRULUGS and QIKLUGS



Both these favorites are *unit* assemblies. Thus cables can be inserted easier and quicker . . . and there are no extra parts to loosen or lose. This feature assures a *stronger, more efficient* connection, too. Both are furnished with tongues blank, or drilled as required.

The Scrulug provides extreme compactness, with high mechanical strength. Only 4 sizes are required to accommodate cables ranging from #4 to #200 . . . or from #14 to 4/0 strand.

The Qiklug also provides extreme compactness, and is equipped with an oversize stud to eliminate all danger of stripping or distortion when tightening. And only 11 sizes of the standard Qiklug are necessary for cables ranging from #3 to 2000 mcm. Also supplied in variations to meet all connector needs.

Catalog giving complete information on these and other time-saving, cost-cutting Burndy connectors gladly sent on request.

Headquarters for connectors

Burndy

BURNDY ENGINEERING CO., INC.

107 Eastern Boulevard • New York 54, N. Y.

PEOPLE

ade this news

Vest Coast Men Promoted y General Electric

Appointment of Victor S. Herrington as manager of the General Electric Transportation division at San rancisco and of James H. Williams Transportation representative in the os Angeles area was announced re-ntly by R. M. Alvord, commercial ce-president of the company.

Since 1926, Herrington has worked r General Electric in the West, serv-g in Los Angeles, Phoenix and in nnection with G-E installations at oulder Dam, Coulee Dam and the os Angeles Aqueduct.

Williams was doing field engineer-g work in Honolulu in 1941 and ined the San Francisco offices of eneral Electric on his return to the ainland.

lsley Will Head Division t G-E Oakland Works

Creation by the General Electric Co. Wire and Cable division of a Works ction at Oakland, Calif., and appoint-ent of B. F. Ilsley as assistant man-ger of sales in charge of commercial erations there was announced last onth.

Ilsley had been general assistant to . V. O'Brien, manager of the wire d cable division and previously had rved in various capacities in that vision. He joined G-E in 1929.

MARK G. MUELLER has been ap-inted Denver district sales repre-ntative for the Railway and Indus-ial Engineering Co. In Denver since 32, Mueller previously was sales gineer for Century Electric Co., vering Pittsburgh, Kansas City and nver territory.

J. HAMILTON CALDER, chairman of rovo Electric Utility Board, has been ected president of the Utah War mergency Power Assn. to succeed . C. Maughan. Maughan had headed e organization since its inception in ebruary 1942.

T. G. WILSON has been appointed holesale sales manager for Mc-nnan, McFeely and Prior, Ltd. at w Westminster, B. C., according to announcement by J. T. Drybrough, anager of the New Westminster anch of the big wholesale hardware, rniture and electrical firm. Wilson spent three years in the hardware business in New Westminster, starting with Anderson & Lusby, which was subsequently taken over by McLennan, McFeely and Prior. In later years he has acted as traveler for the company.

● CHARLES W. MACLEAN has been appointed manager of the Westinghouse School Service department to succeed R. E. Williams, who will devote full time to technical and research activities.

Sierra Pacific Power Names General Superintendent

Appointment of F. G. Barnett as general superintendent of Sierra Pacific Power Co. to succeed the late Charles E. Fletcher was announced last month by President Frank A. Tracy. Barnett goes to his new post from Portland, where he was operating manager of the eastern properties of West Coast Power Co.

Barnett received his engineering training in Ohio and joined the Public Service Co. of Colorado in 1917. Following service in the army in 1918 and 1919, he returned to that company and served successively as general engineer, superintendent of transportation and Southern district manager.

In 1928 he went with Central Public Service Co. and was assistant general manager of Maine Public Service Co. and Maine-New Brunswick Electric Power Co. until 1930. He then went to Rockford, Ill., as operating manager, electric and steam heat, for the Central Illinois Electric and Gas Co.

From 1933 until he went to Portland in 1936, he was district manager in southern Indiana for the Central Public Service Co.

BARNETT

Forman Now Construction Head for Pacific Company

R. E. Forman, Pacific Power & Light Co. has been advanced to the post of superintendent of construction and maintenance to fill the vacancy caused by the death of C. S. Knowles. A. E. Bond, assistant distribution engineer, has stepped up into Forman's former position as chief designing engineer.

Under a new set-up, Forman's headquarters will be at Portland instead of at Kennewick, Wash.

Forman started with Pacific as part-time helper and street light attendant at Sunnyside in the early days of the company. After serving as lineman at Sunnyside and Walla Walla, he became agent at Wapato, new business representative at Toppenish and then went to Portland as draftsman. He became chief draftsman in 1935 and chief designing engineer in 1940.

● DR. NELSON LEE SMITH of New Hampshire has been nominated by President Roosevelt to replace the late Clyde L. Seavey on the Federal Power Commission. Smith went to Washington in 1941 as chairman of the Board of Transportation and Research, an independent agency established under the Transportation Act of 1940. Previously he had been a member of the New Hampshire Public Service Commission for eight years and had taught economics at Dartmouth College for 10 years. He holds a doctorate from University of Michigan.

● CLIFFORD RUSSELL, formerly sales manager of Wesix, Inc., San Francisco, is now director and training officer for the California State War Council Protection College. He conducts air raid warden instruction courses in collaboration with the various city civilian war councils.

● PAUL RICE, managing the electric supply department of Leo J. Meyberg Co., San Francisco, has become a lieutenant j.g., USNR, and has been assigned to the Naval Supply Depot, Alameda. Herbert Atwater, formerly assisting, now heads the department.

● E. F. PEARSON, Northwestern Electric Co., is coordinator for Oregon and Washington in the program for cooperation between military authorities and electric companies in the Western states.

● CARL H. HERKELRATH, assistant electrical inspector of San Bernardino, Calif., has resigned to go into war work, according to Jesse K. Roth, city electrician.

G.C.A.
Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks
Send for Catalogue
We have been making safety tools for 26 years
THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

● GROVER C. GREIMES resigned recently as purchasing agent of Puget Sound Power & Light Co. He had been with the company since 1910 and purchasing agent for 12 years. ALLEN W. FOX, who had been Greimes assistant, becomes purchasing agent.

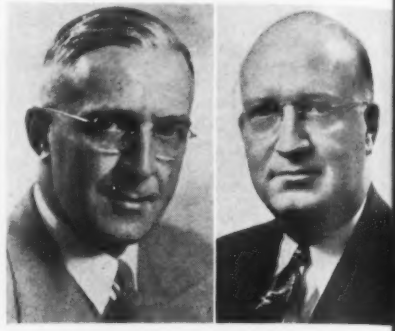
● PAUL W. HAND has been appointed manager of Bonneville's Puget Sound district office.

Member A.I.E.E
JULIEN H. DAVIS
Consulting Engineer
Industrial
Utility-Electrical-Mechanical
740 So. Broadway Los Angeles, Calif.

Westinghouse Supply Makes Salsbury General Manager

Promotion of David M. Salsbury to the position of general manager of the Westinghouse Electric Supply Co. was announced in September. He goes to his new headquarters in New York from Seattle, where he had been manager of the company's North Pacific district since 1939.

William M. Jewell has been transferred from Detroit to Seattle to take over management of the North Pacific district. Jewell was manager of the Supply company's San Francisco office in 1940 and 1941, before going to Detroit, where he was acting manager. He has been with Westinghouse since 1925.



Salsbury Jewell

Salsbury has been in the electric supply business since 1915, starting with the Northern Electric Co. at Calgary, Canada. He worked for electric companies in Oakland and Fresno, Calif., previous to 1918, when he joined Electric Railway & Manufacturers' Supply Co. at San Francisco. After this company was acquired by Westinghouse in 1920, he served as branch manager in the company's Salt Lake City office until he was made North Pacific district manager.

● WALTER J. BAYLIS has been appointed sales engineer and district accountant for Westinghouse Ltd., with headquarters in Calgary, Alta. Graduate in electrical engineering from the University of Alberta, Baylis has been with Westinghouse in Hamilton, Ont., doing war work for the past two years. He will take up his new duties in Calgary in August.

● ALEC REMINGTON is the new electrical inspector for the City of Stockton, taking the place of Harold Hencman, who left recently to enter war work.

● CLARK C. VAN FLEET has been named head of the department of public utilities at Portland to succeed the late Ralph C. Clyde.

TRADE MARK REG. U.S. PAT. OFF.

Nichrome

***Made only by* DRIVER-HARRIS COMPANY**

Stocked for the Coast Trade at

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235-241 San Bruno Ave.

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449 South San Pedro St.

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2122 Fourth Ave.

By

ANGUS-CAMPBELL, INC.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., required by the Acts of Congress of August 24, 1912, and March 3, 1933, of Electrical West, published monthly at San Francisco, Calif., October 1, 1943.

State of California, } ss.
County of San Francisco }

Before me, a notary in and for the state and county aforesaid, personally appeared George C. Tenney, who having been duly sworn according to law, deposes and says that he is the Editor of Electrical West, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

Publisher, McGraw-Hill Company of California.....68 Post St., San Francisco 4, Calif.
Editor, George C. Tenney.....68 Post St., San Francisco 4, Calif.
Managing Editor .....None
Business Manager.....Roy N. Phelan, 601 West 5th St., Los Angeles 13, Calif.

2. That the owners are: Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock.

McGraw-Hill Company of California, San Francisco, Calif.; McGraw-Hill Publishing Company, Inc., New York City; James H. McGraw, New York City; Howard Ehrlich, New York City; R. A. Balzari, San Francisco, Calif.; N. A. Bowers, San Francisco, Calif.; George C. Tenney, San Francisco, Calif.; John W. Otterson, San Francisco, Calif.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amounts of bonds, mortgages, or other securities are: None.

GEORGE C. TENNEY, Publisher.

Sworn to and subscribed before me this 28th day of September, 1943.
(SEAL) W. E. SCHORD,
(My commission expires June 2, 1946)

Sanger is National Sales Manager for G-E Appliances

Alfred G. Sanger, formerly manager of small appliances and heating devices for General Electric Co., has been made national sales manager for the company's appliance divisions.

In his former position, Sanger supervised factory operations, including the G-E iron factory at Ontario, Calif. He recently visited that plant when it was presented with the Navy "E" Award. For the duration, his work will be concerned with war products.

● J. P. Bowden, who retired recently from General Electric Co.'s Appliance and Merchandise department, was honored by his business associates at a luncheon celebrating his 25 years of service in the division. This is the longest record in that division.

OBITUARY

Charles Pryde Cutten

Charles Pryde Cutten, attorney for Pacific Gas and Electric Co. from 1911 until his retirement in 1937 and an authority on rate matters, died Sept. 15 in San Francisco.

Mr. Cutten was born in 1875 in Eureka, California, a town which his family had helped to found. He was graduated from Stanford University Law School in 1899 and admitted to the Bar in 1901.

He was a member of the California State Senate from 1908 to 1911 and, as chairman of its banking committee, was instrumental in formulation of the present Bank Act.

As rate department attorney for PG and E, he was the company's representative in matters relating to the California State Railroad Commission from the time of the commission's organization in 1911 until his retirement. He represented the company in the valuation of PG and E properties in San Francisco in 1924.

● Carl M. Snyder, assistant manager of the General Electric Co.'s Appliance and Merchandise Department, died late in August in New York City. Mr. Snyder had toured the West several times, addressing the Appliance and Radio Trade Dinner at the Western Merchandise Mart, San Francisco, in 1941. He was said to be the father of the modern electric kitchen trend, having practiced architecture, helped in the development of the Walker dishwasher and joined the General Electric organization when that dishwasher was purchased by the G-E Co. He organized the kitchen planning service, arranged for uniform kitchen cabinet sizes and developed the "New American" demonstration home.

● Raymond Hendricks, publicity director for the Public Utilities of Washington, died from a heart attack on Sept. 10 in Seattle. Thirty-three years of age, Hendricks was the son of R. H. Hendricks, who is director of the PUD for Washington state.

● Percy Robinson, manufacturer's representative for Kerite Insulated Wire & Cable Co. in northern California, died Sept. 20 at San Francisco, after an extended illness.

POSITION WANTED

Registered Professional Engineer

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with B. S. and Professional degrees in Electrical Engineering. Eighteen years' experience design, surveys, construction and maintenance of transmission and distribution lines. Thoroughly experienced in right-of-way and real estate.

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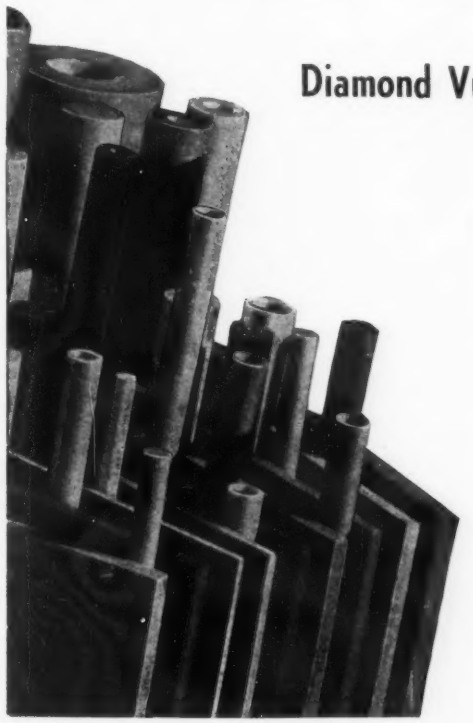
San Francisco 4, Calif.



Diamond Vulcanized Fibre
Celeron
Vulcoid
Dilectene
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Betterments . . . . Not Substitutes!

That is what designers say about *Continental-Diamond Non-Metallics.* On the Pacific Coast, Marwood maintains stocks of C-D sheets, rods and tubes. If you have electrical, mechanical or structural problems involving replacement of corrosive, weighty, costly or scarce materials, Marwood will gladly study your problem and help solve it. Through Marwood there is available to you a staff of specialists at the *Continental-Diamond* laboratories . . . ready to make recommendations, and if necessary, develop appropriate Non-Metallic Materials to suit your particular requirements.

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No. 702

This Sherman Lug Is Made to Handle the Heavy Loads

Here is a heavy duty wrought copper lug with the strength, weight and construction to do the hard jobs — handle big loads. Precision made, free from defects, with FLAT contact surfaces. For transformers, circuit breakers and other heavy duty electrical equipment.

Specify Sherman

- Wrought Terminals
- Ground Clamps
- Solderless Lugs
- Fixture Connectors

H.B. Sherman Mfg. Co.
Battle Creek, Mich.

Sherman

Heavy Duty Lugs

ECONOMICAL

Jeffries Transformers

Reasonable in Price
Reliable in Performance

Jeffries large transformers are priced reasonably—and you can save their first cost in a short time by minimizing current losses. When you use a Jeffries transformer, you can provide voltage change at the point desired, without prohibitive expense.

We supply all types and sizes. If not in stock, we build to order in a hurry—a week to 10 days.

Write today for catalog

JEFFRIES TRANSFORMER COMPANY
1710 E. 57th St. Los Angeles, Calif.

TRADE notes

Westinghouse To Expand Portland Facilities

To expand Portland facilities for repair of marine and industrial electric equipment, Westinghouse Electric & Mfg. Co. has purchased property of the Harris Ice Machine Works at Tillamook and Kerby Sts. in that city. The purchase, said to involve approximately $100,000, includes ground, buildings and machinery.

A factory, office building and small warehouse give the company 22,050 sq. ft. of production and office space. Present quarters include 7,500 sq. ft. H. T. Ley is Portland manager of the Westinghouse Manufacturing and Repair division.

● Mitchell Mfg. Co. of Chicago has appointed John H. Maddox, Jr. its representative for northern California. With this announcement Maddox brought word of two new models especially designed for low cost and critical materials saving industrial applications. First is the all-purpose industrial unit using two 20-watt fluorescent lamps for localized lighting of assembly or inspection lines or over benches, tables, etc. Second is a model known as "Super Special" industrial type made either for continuous row or individual mounting. These models carry both Underwriters' Laboratories and E.T.L. Fleur-o-lier labels.

● Cannon Electric Development Co. of Los Angeles was awarded the Army and Navy "E" for excellence of its war production record. James H. Cannon, and Robert Cannon were recipients of the honor from Major Albert J. Fisher, U. S. Army. The company manufactures electrical cable connectors for aircraft, sound, radio, power circuits and signal equipment.

● Crouse-Hinds Co., Los Angeles office, headquarters for H. L. White, has moved from 1207 E. Eighth Ave., Los Angeles, to Room 501 at 714 W. Olympic.

● Oliver B. Lyman, San Francisco manufacturers' representative, has moved his office to 116 New Montgomery St. He formerly was at 74 New Montgomery.

● L. M. Baxter, district manager of S. & M. Lamp Co., Portland, has moved from 907 N. W. Irving St., to 1238 N. W. Glisan St., Portland 9.

Answer To "Who Am I?"

(See Page 90)

F. A. Tracy

Electriquiz Answers

1. Washers. Washer manufacturers were the first in the electrical field to convert as a class to war work.

2. Electric refrigerators. Under WPB's Order L-5-b, all refrigerators were temporarily frozen in dealers' hands Feb. 14, 1942.

3. The electric iron.

4. Small appliance repairing.

5. Tube. More radios are inoperative through inability to secure tubes than from any other cause.

6. As of Jan. 1, 1943, here is the generally accepted order of saturation, with percentages: (1) Irons, 93.7%. (2) Radios, 87.7%. (3) Refrigerators, 71.8%. (4) Washers, 62.8%. (5) Vacuum cleaners, 49.5%. (6) Percolators, 37.3%.

7. Refrigerators by MPR 139; washers by MPR 372.

8. The only one of the three who could legally secure a refrigerator is the Navy man. Usually, without difficulty by establishing a need, he can secure one under PD-427 through the Ship Service Office of his station.

9. Dr. Lee De Forest, now 70 years of age, but still actively engaged in radio development in Los Angeles.

10. Refrigeration service men. Gen. Hershey wired all state directors of draft boards on July 27, urging that such service men be deferred or that induction be postponed.

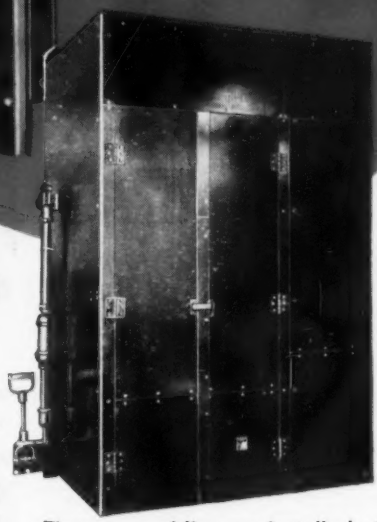
YOU CAN BREAK LOAD WITH THIS SWITCH

Wall Mounting Type

and Get Short-Circuit Protection with a Fuse Combination

● Manual switching of high voltage circuits—and reliable short-circuit protection are provided in one unit assembly,—in one cabinet, by the Load-Interrupter Disconnect and Fuse Equipment designed and pioneered by S & C.

The Load-Interrupter Switch is capable of interrupting up to 400 amperes at 15,000 volts without drawing an arc across the main switch contacts. The Heavy Duty Fuses have short-circuit interrupting ratings of:—20,000 r. m. s. amperes at 13,200 volts; 25,000 r. m. s. amperes at 6600 volts; 30,000 r. m. s. amperes at 2300/4000 volts.



These assemblies are installed at substations, main and branch feeders, and employed as throw-over devices from two alternate feeders. Consult the nearest S & C office for further details of this equipment and its many applications,—or write today for Bulletins 202-A and 763.

For many services where all the functions of circuit-breakers are not essential, this load-switching and fuse combination assembly has found wide acceptance during the past few years, effecting savings in initial installation and maintenance costs, and conserving critical metals.

SCHWEITZER & CONRAD, Inc.
4435 Ravenswood Avenue CHICAGO, ILLINOIS

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T. S. Wood, 220 Ninth Avenue, North
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Riter Engineering Co., Kearns Bldg.

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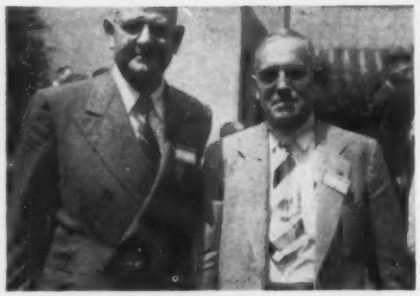
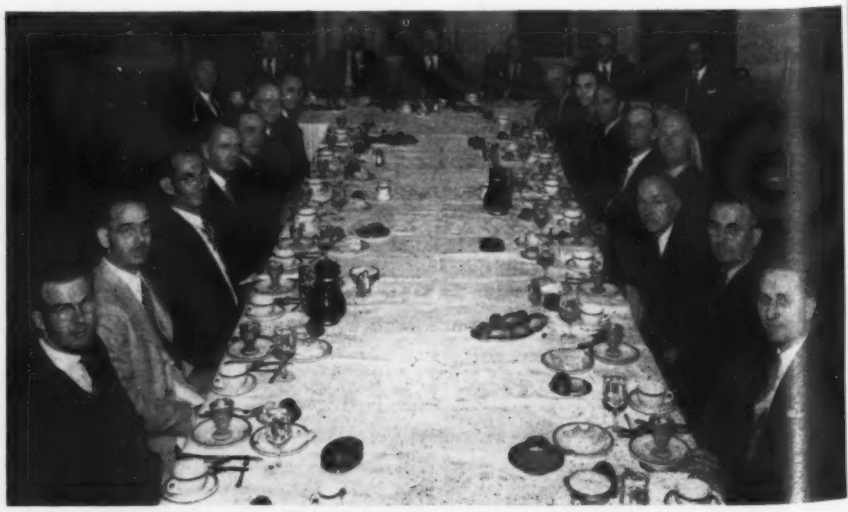
PROFILES *of the month*



At right, C. C. Baker, new RMEL president, from Colorado Central Power, Golden, Colo.

Above, Harry Dobson, Santa Barbara inspector and Joe Siddall, H. H. Robertson Co., at Southwest inspector meeting. Below, O. K. Jones, Los Angeles city and Art Veit, Los Angeles county, chief inspectors both, at the same meeting. Mrs. H. G. Ufer, who engineered the ladies' entertainment, at the right

Past and present officers of the EMEA of Southern California, at the annual dinner below, include: N. Swanson, secretary, T. Hughes, R. L. Coon, C. F. Kimball, C. C. Gifford, C. Hoag, C. Andrae, F. Hockensmith, H. C. Park, W. P. Ritter, W. A. Smoker, president, G. Farr, H. J. Hutt, J. H. Davis, H. M. Schabbleman, W. King, H. Bush, J. Ellis, W. Starkey, C. Miller, E. O. Miller and W. Colburn. These men helped the organization grow to its present membership of 500 since 1935. All have served as executive committeemen during the past



LAKE TENDER . . .

Where Power Starts on High

I AM A LAKE TENDER...guarding water that in a matter of minutes shoots down penstock pipes, to spin the turbines that make the kilowatts that march down power lines to work in war production on the farm, in city and in factory. My job location is high in the Sierra mountains.

Usually the work is just patrolling the shores of a lake and watching the water level at the gauge tower.

Today I keep a sharp vigilance for forest fires, do airplane spotting and make doubly sure that logs and twigs and brush do not move down the lake to the forebay surge chamber and cause a powerhouse turbine to shut down. That must not happen in wartime when electric power generating plants must operate full time. I know what a shut-down would mean, because I can see electricity in use in the valley below. There are lights in farm dwellings, little clusters of lights in valley towns, bigger clusters of lights in more distant cities.

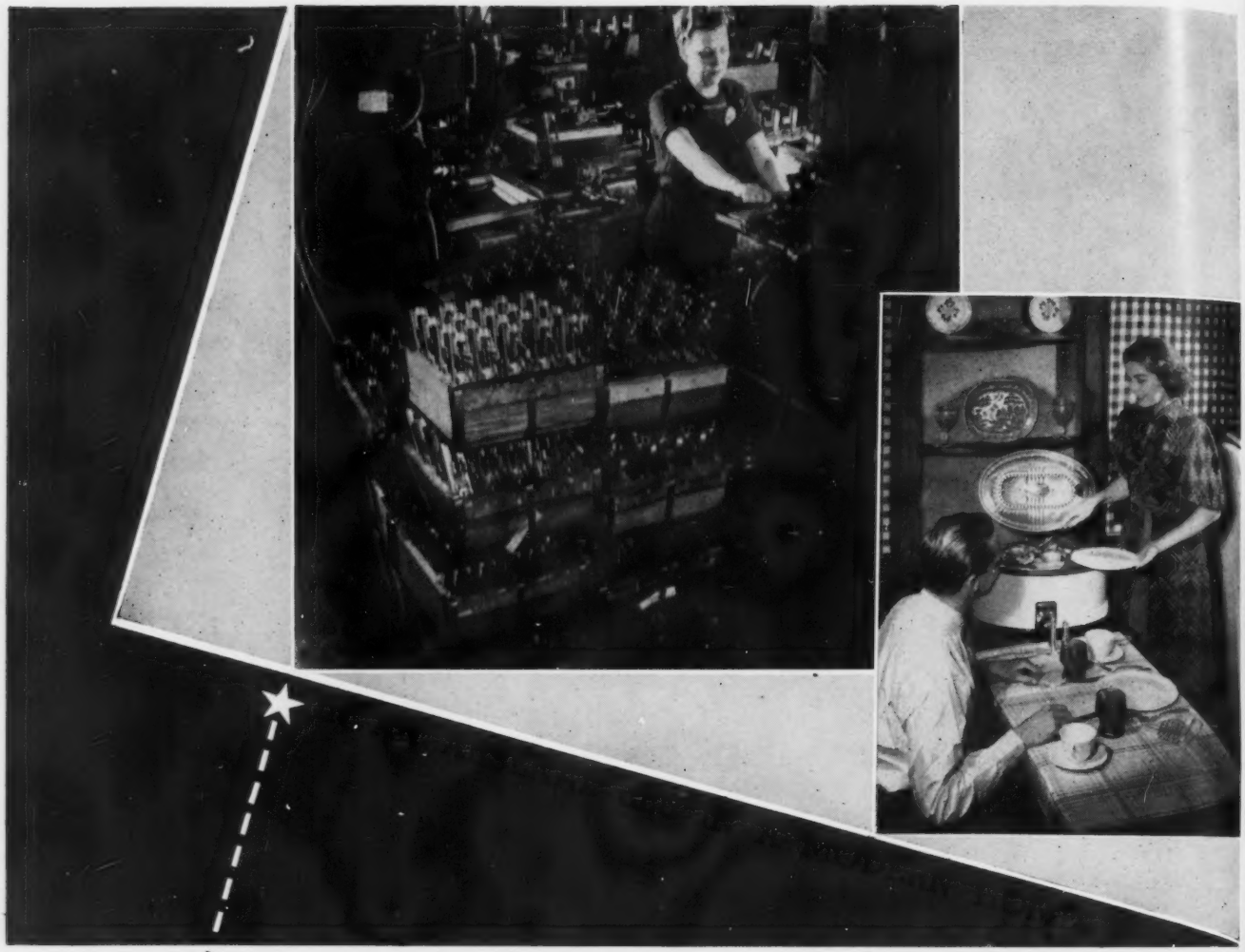
I know, too, that electric power from the plant below my lake goes down to food packing plants, to shipyards, to factories and to army and navy bases, vital to our victory.

Then I remember the day when some of the young men from the power plant below came up to my forebay to shoot ducks. These young men are shooting down Zeros and Messerschmidts today. I remember, too, when I showed young men where the big fish were in the pools of the mountain streams near here. I know these young men are out to get bigger and more dangerous fish today.

These things make me wish I were younger. I would be one of the young men fighting. But I realize I can't. I am going to stick here and try to be the best lake tender in the world. That is how I can best help win the war.

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY



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Lillian Allen makes an important part for the famous Garand rifle. Helped only by electricity, she is able to operate not one but three huge machine tools. Her daily production of clip and ammunition receivers is almost unbelievable.

Here, in dramatic form, is the secret of a modern, work-easy home. Up-to-the-minute electrical equipment . . . careful attention to location and arrangement . . . plus wiring and controls that provide the utmost in convenience and useability.

Not necessarily found in big or expensive homes, adequate wiring is mostly a matter of appreciation. Let a person understand what it means and what it does for him, and he's more likely to include it in his plans. Your job is to see that he **does** understand. For facts and figures call

PACIFIC COAST ELECTRICAL ASSOCIATION

601 WEST 5TH STREET, LOS ANGELES • 447 SUTTER STREET, SAN FRANCISCO

Graw-Hill Co.
f California